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U.S.: Gathering Steam

By Catherine Arnst
Of the CW Staff

NEW YORK – IBM attempted to turn plug-compatible manufacturers (PCM) into "dying companies," Justice Department attorneys charged recently as the government began the peripherals portion of its antitrust case against the corporation.

The government will attempt to prove that separate and distinct markets exist for the different peripheral products, that PCMs were able to enter those markets successfully with products equal to or better than IBM's at prices 10% to 15% lower and that IBM used its dominance in the computer market to destroy that competition.

In what it considers one of the more powerful segments of its case against IBM, the government will present approximately 550 documents and 13 witnesses to the court in the next few months.

Those witnesses will include Laurence Spitters, founder and former chairman of the board of Memorex Corp., three others from Memorex, three witnesses from Storage Technology Corp., two from California

(Continued on Page 2)

IBM On Trial

Calcomp: 'Show and Tell'

By Molly Upton
Of the CW Staff

LOS ANGELES – The California Computer Products, Inc. (Calcomp) antitrust trial against IBM will be a "show and tell" trial illustrated by charts, judging by the opening statements of both sides.

Charts are but one illustration of how trial by jury will influence the conduct of the case.

Judge Ray McNichols denied IBM's motion for a mistrial the morning after Calcomp attorney Max Blecher's opening statement.

David Boies, attorney for IBM, had asked for a mistrial on the grounds that Blecher's statement (see story on Page 3) "went very substantially beyond what is appropriate in any case, particularly before a jury."

Blecher's remark contained "constant repetition of argumentative words," whose only purpose was to "prejudice, confuse and inflame the jury," Boies said.

Blecher also used IBM documents in a misleading manner, taking at least one out of context, he said. That document, according to Blecher's

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NEWSPAPER

COMPUTERWORLD

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An Offering Not for the Novice

IBM Moves Into Mini Arena With Series/1

By Esther Surden
Of the CW Staff

NEW YORK – IBM made its long-expected move into the minicomputer arena with the introduction of the Series/1 here last week.

The Series/1 is a minicomputer in every sense – from its 16-bit word and its limited operating system software to its purchase-only status.

It is also in the price range of standard minicomputers.

A Series/1 Model 3B with 32K bytes of storage, diskette and disk combination unit, printer and attachment for a teletypewriter costs $22,312, according to an IBM spokesman. The CPU with 16K bytes of memory costs $5,190, he added.

The Series/1 was designed for volume use by sophisticated organizations with programming and systems design know-how, but quantity discounts will not be available, IBM said.

The modular, component-oriented mini, which can be configured in any number of ways, is in the performance range of the Digital Equipment Corp. PDP-11/34, Hewlett-Packard (HP) 21MX and Data General Corp. (DG) Nova, the spokesman claimed.

DEC and DG would not comment on the cost of their comparable minicomputers. HP, however, said the Series/1 could be compared to its 660 nsec 2112A with 14 I/O slots and 16K bytes of memory which costs $7,900 including extensive software and is discountable.

Two Series/1 processor models with two submodels each were introduced. The Model 3A on one board fits into half the width of the available 19-in. rack space and contains a card cage with four I/O card slots. Each I/O card can address one to 16 devices, the firm said.

The Model 3B differs from the 3A only in that it has 13 I/O slots.

Both units feature a 64K-byte maximum storage capacity with an 800 nsec cycle time for the memory. Average instruction time is 11.8 μsec, IBM said.

The Model 5A can accommodate up to 64K bytes of memory and has eight I/O slots. The B model can accommodate up to 128K bytes of memory and has three I/O slots.

Memory cycle time for the Model 5 is 660 nsec; average instruction time is 3.9 μsec. Both units include a storage protect feature and are contained on three boards, IBM noted.

The Model 3 has a 168-instruction set while the Model 5 has 177 instructions. Each can address up to 256 devices and features four priority interrupt levels with

(Continued on Page 4)

CPE Finds Three 65s Can't Equal a 168

By Don Leavitt
Of the CW Staff

ATLANTA – Although the CPU capacity of an IBM 370/168 is roughly three times that of a 360/65, the 168 can absorb "considerably more" work than would saturate three 65s, according to a computer performance evaluation (CPE) technician with American Airlines.

American's in-house evaluation and benchmark team reported these results as part of its evaluation of a 4M-byte 370/168 and a 4M-byte Amdahl 470V/6, according to Bill Miller, who explained the airline has already made the decision to buy one or the other.

Presenting a paper at the annual national meeting of the Computer Measurement Group (CMG) here last week, Miller said the performance of a Model 65 "is generally agreed to degrade" when the total CPU occupancy goes above 60% to 70%.

However, he added, "a 370/168 can be driven at essentially 100% for sustained periods of time" and further economies are available from consolidating peripheral devices and other resources required to satisfy peak demands on several machines.

The CPE staff at American reached these conclusions in its still continuing search for another large-scale processor for its commercial DP operations, Miller said.

The current equipment consists of a 370/168-1 surrounded by 40 6,250 bit/in. tape drives, 64 Memorex 3330-type disk drives and 16 IBM 3350 fixed-head disk units.

Evaluation Tools

The airline is using a number of tools to aid its evaluation, he told the group. The three basic types of tools include SMF analysis packages, software monitors and hardware monitors.

In most large-scale IBM shops – including American Airlines – SMF data is collected "as a matter of course" and "failing to glean as much information as possible from [this] data [would be] a serious mistake," he said.

Miller's group uses the Sara package, developed by Boeing Computer Services, to analyze SMF output, running it daily as the source of most routine management reporting, he explained.

Software monitors yield more detailed information about system internals than SMF but, used poorly, they can create overhead, tie up an initiator and cause system crashes, he warned.

Nonetheless, American uses the Configuration Utilization Evaluator (CUE) package from Boole & Babbage, Inc.

Hardware monitors attach to the wiring of a computer system and cannot produce the problems some software monitors do. However, the large sophisticated type of monitor American needed is a very expensive piece of gear, he said.

Miller's group recently acquired a Tesdata MS88-III for use in providing continuous system profiles for all major applications as well as doing detailed measurements for the IBM-Amdahl benchmark, the technician said.

Ryan, Hammer Theories Collide On DP's 'Pathway to the Future'

By Edith Holmes
Of the CW Staff

ALEXANDRIA, Va. – Computers should be used for the economic replacement of routine tasks, but not in areas where human judgment is involved, Dr. Frank B. Ryan, director of information systems for the U.S. House of Representatives, told the Association of Computer Programmers and Analysts (Acpa) conference here recently.

The more memory the computer industry can pack on a chip, the closer human society will come to artificial intelligence and from there to voice-to-voice communication with computer systems, Dr. Carl Hammer, director of computer sciences for Sperry Univac in Washington, D.C., said to the same meeting of programmers and analysts a day later.

Two different men. Two opposing ideas. A pivotal point on which the conference, entitled "Pathways to the Future," turned.

At the beginning of his career, Ryan was a football player, a quarterback for the Cleveland Browns and then for the Washington Redskins.

While playing for the Browns, Ryan wrote a computer program called "Probe" to organize and analyze football data, aiding trend analysis. Ryan said he devised the program to take the drudgery out of the night-before-the-game strategy sessions.

Probe provided a study of the opposing team and a strategy for the Browns to

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As Calcomp vs. IBM Opens

Defense Stresses Competitive Market

By Molly Upton
Of the CW Staff

LOS ANGELES – The DP industry demonstrates all the elements of a competitive environment where participants are constantly needing to upgrade their products and reduce prices in order to obtain and retain business.

David Boies, a lawyer for IBM, thus set the tone for IBM's defense in the antitrust case filed against it by California Computer Products, Inc. (Calcomp).

Focusing on the issue of monopoly for the entire morning and into the afternoon, Boies told the jury that in order for Calcomp to recover damages, it would have to establish all five of the following points:

- What the market is.
- IBM possesses monopoly power in that market.
- IBM has achieved its position in the industry in some kind of wrongful way.
- IBM's actions were wrong and damaged Calcomp.
- The extent to which Calcomp was damaged.

Jack Brown, another lawyer for IBM, amplified the last two points in IBM's defense and indicated Calcomp's declining revenues resulted from being outpaced by advances in disk drive technology and Calcomp's own management problems, not action by IBM.

In deciding whether IBM is a monopoly, Boies said the jury would have to ask itself whether "IBM is a company able to sit back and ignore competitors, leading a quiet life, or whether it is constantly forced to improve its product and reduce prices."

If customers have no alternative to an overpriced product, then there is a monopoly, he said.

Calcomp has done well in the computer business, he said, having been able to offer products at lower costs than IBM's because it copied them and, therefore, didn't incur extensive research and development costs.

To illustrate IBM was no larger than its competitors, Boies showed a 1952 ranking of the revenues of large U.S. industrial firms. IBM was seventh behind such future competitors in the DP field as General Electric, RCA and Sperry Rand.

Calcomp, he said, has conceded 31 companies compete in the general systems marketplace. But there are many more including Hewlett-Packard, Interdata, Four-Phase Systems and Itel, he said.

Boies then showed several charts illustrating the rise of firms' DP revenues during the period in which Blecher had said IBM sounded "the death knell."

Although all of the companies illustrated showed revenue growth, Boies did not once mention earnings or losses of these firms.

This growth in both the number and size of firms in the industry and their ability to compete illustrates the lack of monopoly power, he said.

Boies said he will counter Calcomp's charge that IBM kept revenues constant by raising CPU prices while lowering disk prices, for example. His retort to this argument is that computing costs have declined despite a rise in the consumer price index.

This price decline is the "best illustration of the fruits of competition in the industry benefiting the consumer," he said. IBM has been a leader in improving price/performance offerings.

"In effect, Calcomp is arguing that IBM should be required to keep its prices high so it [Calcomp] could make more money," Boies said.

Boies said IBM has three basic beliefs which contribute to its success:

- It must maintain respect for the individual.
- IBM should provide the best customer service.
- The organization should strive to do every task in a superior fashion.

The Calcomp claims, Brown charged, are based on two erroneous assumptions – that there would be continued demand for old disk products and that even if these products were obsolete, as they were by 3330 technology, Calcomp could continue to get a fair price for them.

U.S. vs. IBM Gathering Steam

(Continued from Page 1)

Computer Products, Inc., three representing add-on memory manufacturers and two from the Bank of America.

"Prior to IBM's actions to eliminate and restrict actual and potential competition in the plug-compatible peripherals market, the PCMs were successful in the small segment of the market they captured.

The peripherals market was important to IBM because it accounted for 53% of total systems business in 1970; by that year, PCMs had made considerable inroads into IBM's dominance of that market, the government said.

A number of companies had entered the peripherals market after IBM announced its 360 line in 1966 because, for the first time, IBM's differently sized commercial systems were capable of using identical peripheral equipment; the plug-compatible market was made even more attractive by IBM's high price levels and profit margins on these products.

IBM designated peripherals as a "key corporate strategic issue" in 1970 after the government issued a directive in the Peripheral Equipment Procurement Bulletin No. 70-9 requiring federal agencies to "review all installed leased peripheral components for which there are compatible, reliable and comparable substitutes available at lesser cost.

At a management committee meeting after this bulletin was issued, IBM internal documents show, the corporation decided to assess all factors affecting the impact of competitive products on IBM's business and then produce a strategy of technical escalation.

One of the strategies a task force recommended and IBM adopted, code-named "Mallard," was aimed at the disk drive market.

The government claimed this disk drive was only a revised version of the 2314 because IBM had replaced one spindle with a portion of the control function normally found in the 2314 controller.

The remainder of the control function was transferred to the CPU and called an Integrated File Adapter, Justice contended.

In the tape drive market, IBM attempted to undermine competitors with a new series of tape drives, the 3420, codenamed "Aspen," the government claimed. The 3420 was a "warmed-over" version of the "overpriced" 2420, whose sales were dropping, it said.

Aspen had the same physical and performance specifications as the 2420 but a different interface design and price tag.

In order to prevent further competition, IBM approved long-term lease plans in early 1971 that would offer substantial price reductions to users while locking them into a total IBM system. Through the Fixed Term Plan (FTP), offered for tape drives, disk drives and printers, IBM offered an 8% discount on a one-year lease and a 16% discount on a two-year lease.

In order to recoup its losses from the leasing plans, IBM announced price increases in July 1971 on CPUs, memories and other portions of the systems not covered by FTP. In August 1971, IBM executives predicted "the net effect of [FTP] and CPU price changes will be a wash insofar as business volumes are concerned," internal documents said.

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Plaintiff Claims Documents Will Prove IBM's Guilt

By Molly Upton
Of the CW Staff

LOS ANGELES – California Computer Products, Inc.'s (Calcomp) $102 million antitrust suit against IBM will be conducted largely through examination of internal IBM documents, Calcomp attorney Max Blecher told the jury in his day-long opening statement here last week.

The jury can "determine IBM's guilt by its own documents [which constitute] a diary of all acts and purposes" with which Calcomp is charging it, he said.

IBM, between 1963 and 1972, undertook conduct to "eliminate, suppress and destroy competition for the purpose of maintaining its monopoly," Blecher said. The 1972 date was selected because that was the year in which IBM last attempted "to do in" Calcomp, he explained.

This "nailed the lid in the coffin of a company which until then had been a vigorous, profitable company," he said.

Calcomp is charging IBM attempted and/or succeeded in its monopolization plans for the industries of general-purpose systems, disk drives and disk drives attachable to IBM 360s and 370s.

Blecher used the analogy of a gun turret that could turn and lash out at different areas IBM saw as threatening.

Why the three areas? Partially to show IBM had the capacity to trade off profits from one area to another when it decided to focus its turret, he said.

For example, Blecher said he will illustrate through IBM documents that IBM decided to take low profit margins on certain CPUs it would market for prestige reasons while recouping much of this low profit margin through high peripheral charges.

When the number of IBM mainframe competitors had been reduced, IBM then focused on the plug-compatible manufacturers such as Calcomp, he said.

Again through IBM documents, Blecher said he intends to prove to the jury that IBM used this procedure in reverse, cutting prices by repackaging its 2314 drives as 2319M.

IBM then initiated its Fixed Term Plan (FTP) which offered users at least a 16% savings over two years – but a month later, it raised CPU prices to make the FTP costs to IBM a wash item, Blecher said.

After focusing on IBM's and others' views of the corporation's market share in the general-purpose systems industry, the Calcomp case will look at IBM's actions in the systems area, Blecher said.

The attorney showed the jury various IBM documents indicating IBM had over 70% of the general-purpose market between 1964 and 1969.

In the scientific area, Blecher's thesis that IBM did not maintain its monopoly solely through superior products is supported by documents that show IBM machines were "outpriced and outperformed," according to Blecher.

The Calcomp case will then focus on IBM's attitude toward and reaction to the leasing industry, which it came to regard as a competitor, not a customer.

Leasing Industry Strategy

IBM deliberately calculated its multipliers, or the number of months' rent, that equal the purchase price, in order to "knock lessors out," Blecher stated.

The company also deliberately brought out the 370/155 and 165 "with the knowledge these would be withdrawn in 18 months, leaving lessors with an inventory of obsolete machines," he charged.

Lastly, the prosecution will focus on actions in the plug-compatible industry, an issue with which Calcomp is personally concerned and for which it claims damages.

Calcomp vs. IBM:

'Show and Tell' Trial

(Continued from Page 1)

presentation, showed IBM management contemplating leaking to the investment community news of its planned 370s two years before their introduction.

The purpose of such action, Blecher alleged, would be to help dry up financing available to lessors.

Because the jury had witnessed Blecher's version of this document, it was "just not susceptible to later coming back and correcting" its mistaken impressions, Boies argued.

At the end of the day when the jury was dismissed, McNichols talked to counsel and spectators.

For the record, he said he recognized that opening statements in this case "have gone far beyond the normal scope of opening statements."

But doing so has done far more to further the jury's understanding of the case than proceeding with the old "sterile" type of opening statements, he added.

After IBM attorney Jack Brown described what some would consider unethical although not illegal activities by Calcomp, McNichols remarked the "pot and the kettle are equally discolored."

In attempts to indicate to the jury how incriminating internal documents from the other side are, both Calcomp and IBM have enlarged reproductions of these papers, in addition to fancy graphs.

The IBM counsel table was festooned with a large pink and yellow inflated duck as well as several toys and other gadgets which represented a money-losing venture by Calcomp.

During his discussion of Calcomp's attempts to obtain and copy IBM's disk designs, Brown placed before the jury two spindles from a 3350 drive. He also gave them a head and arm from the drive and showed an enlarged version of that mechanism.

Spectators who had lined up at 8:30 a.m. to procure a seat on uncomfortable wooden benches appreciated the repartee between the judge and lawyers on the subject of the toys.

Attorneys for both sides seem acutely aware the case could proceed to appeals court. In replying after Boies' objection about his use of documents, Blechers stated IBM intends to fight the admission of evidence document by document since it expects to be the appellee in the appeals court.

Blecher compared the IBM tactics to Iwo Jima. "We'll win, but it will be one piece of real estate at a time.

"This is the same kind of assault IBM has waged on Edelstein," he said, referring to the judge in the New York trial.

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IBM Enters Mini Arena With Series/1

(Continued from Page 1)

eight general-purpose registers per level.

Bit, byte, word and double-word addressing can be accommodated, the spokesman noted. Power failure detect and automatic restart are standard features.

The I/O channel can operate under direct program control or can cycle-steal. Data is transferred on either a byte or word basis and parity checking is available on a byte basis.

Data is transferred over the channel at 1.2M byte/sec maximum for the Model 3 and 1.6M byte/sec maximum for the Model 5, IBM said.

The Series/1 comes with no standard higher level programming language. Operating system software provided at no charge consists of Stand-Alone Utilities (formerly known as the System Control Program).

The Stand-Alone Utilities include modules to prepare and service disk and diskette devices, IBM said.

Software not included but available is Control Program Support, a set of object modules which provide task management and DP I/O support. IPL loaders for both the disk and diskette are provided. This product costs $15.50/mo on a 24-month, paid-up license basis, IBM said.

Also available is a Base Program Preparation Facility (BPPF) for applications program development. It includes a text editor, macro assembler and linkage editor and costs $90/mo on a 24-month, paid-up lease.

With the BPPF, "theoretically any higher level language can be programmed, provided the user generates his own compiler," the spokesman noted.

If a Series/1 CPU is sold by a user after the 24-month period, the new user will have to pay to relicense the software, he indicated.

An optional I/O expansion unit for the Series/1, including a power supply, provides space for up to 14 additional feature attachment cards.

Communications can be handled on the Series/1 via asynchronous, binary synchronous, or Synchronous Data Link Control (SDLC) single-line control at 9,600 bit/sec maximum; high-speed binary synchronous single-line control at 56 kbit/sec maximum; or asynchronous and binary synchronous four- or eight-line control at 9,600 bit/sec maximum, IBM said.

The Series/1 CPUs can communicate with IBM 360/370s, IBM 3s or each other under SDLC, the spokesman noted.

The floating-point processor option for the system allows both single- and double-precision arithmetic using 30 additional instructions and four 64-bit registers, IBM said.

Another optional feature is the Model 4964 diskette unit featuring IBM's double-sided floppy disk. The microprocessor-controlled unit, which is capable of reading and writing on both sides of a diskette, can contain 492K- to 606K bytes of storage depending on the sector size chosen.

Data formats of 128-, 256- and 512 bytes per sector can be accommodated. The average data rate is 31.2 kbyte/sec, the firm said.

A Model 4962 9.3M-byte disk storage module with two movable data heads and 303 track/head is another optional feature for the Series/1. Average access time is 40 msec with an average access time of 10.1 msec.

A fixed-head option adds another 120K bytes of storage capacity, the spokesman said. A combined diskette and disk unit is also available.

A sensor I/O unit, also optional, can be mounted in half of the standard rack. It includes power supply, terminator card and slots for eight sensor I/O feature cards. The cards are of standard size, IBM emphasized, to facilitate the attachment of standard sensor I/O devices.

Additional optional features include the Model 4974 serial printer, a 120 char./sec bidirectional tabletop matrix printer with a 64-character set, a CRT with a 24-line by 80-character display and a 66-key keyboard with a battery backup unit.

Catamore Case Takes Unusual Appeals Turn

BOSTON – In an unusual move, the First Circuit Court of Appeals here last week ordered IBM to provide additional data on its case with Catamore Enterprises, Inc. before issuing a ruling on the jewelry manufacturer's petition for a rehearing of the case.

Sources described the move as "unusual," adding that if the court is about to reverse itself, this would probably be a logical step in that process. No one around the court could remember such a request being made before.

Earlier, the appeals court had overturned a lower court decision awarding Catamore $11.4 million in damages, holding that Catamore had waited too long to file its case against IBM and the jury in the original trial had not specifically found IBM guilty of fraud.

Catamore is now seeking to have the appeals court rehear that decision. If the appeals court does not rehear the case, it has ordered a new trial for the case at the district court level.

In a statement, Thomas K. Christo, attorney for Catamore, said, "We're very encouraged by the court's action and are looking forward to a new appellate opinion.

Correction

The Burroughs Corp. B1800 series provides 40%, not 40 times, more throughput than its B1700 predecessor [CW, Nov. 15].

AT&T Antitrust Trial Gets Rolling Again

WASHINGTON, D.C. – After debating the question for nearly two years, a federal judge here has decided he and his court do have the authority and responsibility to hear the U.S. government's antitrust suit against AT&T.

Judge Joseph C. Waddy ruled from the bench last week that the U.S. District Court for the District of Columbia, not the Federal Communications Commission (FCC), has jurisdiction over U.S. vs. AT&T.

First raised by AT&T in February 1975, the question of whether the federal court or the FCC should hear the government's complaint against the telephone company caused Waddy to stop all document exchanges and interviews with prospective witnesses by the parties.

The judge's decision on Nov. 16 means the Justice Department and AT&T can move on with their discovery procedure.

Ryan, Hammer Theories Collide

(Continued from Page 1)

follow, he explained.

Shortly after writing Probe, Ryan was "dismissed" from the Browns and went to play for the Redskins. In Washington he encountered Vince Lombardi, who was excited about Probe's possibilities.

The system was developed and successfully marketed, Ryan recalled. It ran on a central computer based in Cleveland and was used jointly by the Giants and the Redskins – except when they played each other, he said.

In 1971, these two teams won five games and lost 23. Both coaches were fired and "Oro-Probe," as the program was then called, was canned, Ryan said.

Two things were wrong with Probe, its author stated. Before the program, the coaches enjoyed the freedom of using their own intuition. The computer system forced them into a rigorous method to which they weren't accustomed.

Probe took human judgment out of planning strategy. Ryan concluded he really couldn't put this human activity into a machine.

The eight computer systems in the legislative branch of the Federal government either substitute for or complement a routine procedure, Ryan said. None of these systems have applications that replace human judgment.

Carl Hammer, who has been involved in electronic computing since it began, presented a somewhat different view.

"It took man thousands of years to shake off physical labor," Hammer said. "Now we must learn to let machines do our mental drudgery for us; we must become a knowledge society."

The 1M chip is coming, he predicted, and with it a kind of "artificial intelligence" including computer voice input.

"Today, we communicate with the computer through our fingers," he said, pointing out the inefficiencies – not to mention the errors – involved in this process.

"With 1M chips, we'll be able to go to computer voice input," Hammer said, adding "selective speech recognition is going on now, but it won't be practical until we have a 100K chip or better.

Computer voice input will be followed by true voice recognition represented by going from voice into print. Chips with 10M capacities will permit language translation – from print to print. Chips with 100M capacities will allow voice-to-voice language translation, thus putting all the United Nations translators out of business, Hammer said.

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Urged to Manage Technology's Destiny

Software People: Keepers of Man-Machine Interface

By Edith Holmes
Of the CW Staff

ALEXANDRIA, Va. – "It is up to you, the programmers and analysts, to serve as the interpreters between the human being and the machine," Rep. Charles Rose told the annual conference of the Association of Computer Programmers and Analysts (Acpa) here recently.

"The software challenges are not with technique but with content, and the real pressures that face the whole industry in the future will center not on mechanical and technological fantasies but on designing software to meet the needs of the users," the North Carolina Democrat said in his keynote address to Acpa's sixth annual meeting.

Comparing the technology of the computer and communications industry to a train moving forward at increasingly uncomprehensible speeds, Rose urged his listeners to manage destiny, "to take charge of the train."

Rose, who chairs the Ad Hoc Computer Subcommittee of the Committee on House Administration in the U.S. House of Representatives, drew his analogy from a story about Supreme Court Justice Oliver Wendell Holmes who, at age 88, found himself on a train and unable to find his ticket.

Recognizing the jurist as he searched unsuccessfully through his coat pockets, the conductor told Holmes not to worry. He would probably find the ticket later, and the Pennsylvania Railroad could certainly trust him to mail it in, the conductor said.

The congressman said Holmes then looked up at the conductor with some irritation and said, "My dear man, that is not the problem at all. The problem is *not* where my ticket is. The problem is, where am I going?"

Technology Train

"We are on a technological path, a train if you like; we have been given the right to passage; and we are speeding forward. Suddenly, when it comes time to turn in our technological ticket to get off the technological train, we don't know where it is," Rose said.

"And what is worse, we have become so programmed to follow directions and punch time clocks that we have forgotten where we are going."

How fast is the train going? Advances in computer-assisted instruction and medical diagnosis by computer and the possibilities presented by voice-sensitive typewriters and complete home telecommunications systems give some idea of the speed with which technology is moving forward, the congressman suggested.

Software people – not hardware people – should have charge of the human interface, in Rose's view.

"The inventors of hardware and the entrepreneurs who sell it have unbounded enthusiasm for the future, for they clearly see that anything is technically possible and they are rushing forward to invent it," he said.

"Unlike Justice Holmes and many of us, they have their keypunched tickets firmly in hand; some of them have even laid the railroad track and built the train; and they know *exactly* where they are going.

"Hardware people love hardware. But sometimes software folks wonder if they love people," Rose continued.

Software is the key to using technology creatively, the congressman said.

"Justice Holmes had a ticket with the name of the city printed on it. He had a program, a direction. Without it, the train was useless to him. It was, in fact, an obstruction. He was lost without the software," Rose said.

In part because the development of software packages involves people rather than machines, the attendant policy issues that must be considered by the courts and in Congress are complex, Rose stated. Two areas being addressed in both these places now are copyrights and privacy, he added.

Rose questioned in particular whether industry should have the right to take public-paid-for information and process it into private software packages, copyright it and sell it back to the government.

"On the other hand, when a professional programmer initiates a package of information which is innovative and useful, combining various aspects of software technology such as indexing and abstracting, it does seem fair to reward that individual with a copyright," he noted.

While the congressman said he did not know how the questions of copyrights for software or of software patentability will be resolved, he expects the new copyright laws being written in Congress and future court rulings on software patents to deal with these problems – and quite possibly in the industry's favor.

CW At Acpa

Rose noted everyone in the audience knew of the abounding dangers concerning privacy. Attempts to protect privacy are fallible, he said.

But "if we are ethical about the kinds of information we put into data bases, and if we are careful to include only the essentials about individual lives, we may find we do not need to worry so much about protection," he said.

Finally, Rose urged his listeners to follow all congressional attempts to set policy in connection with the industry. "We make mistakes and misjudgments. We are ordinary citizens like the rest of you and these new inventions are taking us into a world we do not understand either. We are doing the best we can with what we know and what others tell us," he reminded them.

The congressman suggested the programmers and analysts begin their coverage of activities on Capitol Hill by following hearings on the various "Bell Bills" being held by the House Subcommittee on Communications, chaired by Lionel Van Deerlin of California.

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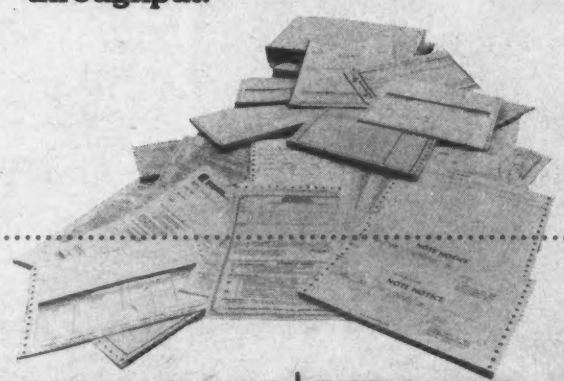

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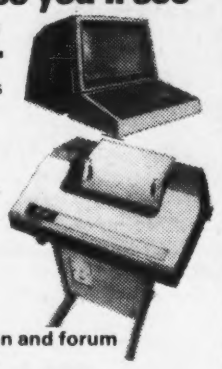

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Cost-Control System Suggested To Involve Entire Firm in DP

By Don Leavitt
Of the CW Staff

ATLANTA – Because the effective use of DP resources hinges on the involvement of all affected groups within a corporation, a coherent system of cost control may be the mechanism to provide that involvement, according to a consultant for Arthur Young and Co.

Corporate, operating division and computer center management each have opinions of what constitutes DP "performance" and each can be motivated to contribute to that performance, William Sherer told a Computer Measurement Group (CMG) session here last week.

Cost information per activity is a "common denominator" understandable to all parties impacted by DP; a system that encompasses expenses, system activities and planned personnel and machine changes might well bridge the communications gap that often exists between these groups, he added.

To be effective, however, the cost-control system must be designed around the needs of the groups involved, he warned.

CW At CMG

Senior management is responsible for deciding what functions have DP potential and for keeping the computer center activities in balance with efforts of the rest of the organization, Sherer reminded the group.

But it is departmental or division managers who have responsibility for the final output of the information from the computer center, he said, adding responsibility in this instance is defined not in the technical sense of efficient operations per se but in the general sense of cost per job performance.

The operational manager is in the best position to judge the computer-generated output and its value to his own area, but there are subjective factors that influence the thinking of many of the managers at this level, Sherer said.

The manager has to be concerned about the service level – the turnaround or response time – he can get from the data center. But the tuning done by the DP technicians is invisible to him.

In much the same way, concern for reliability of results is natural, but this is out of the control of the operational manager, he added.

The computer center management is much closer to the specific work than the other groups. A cost-control system would reveal the real costs of current projects, applications development work and even some possible configuration changes, Sherer noted.

There are four components in an activity-costing system, he went on. The definition of each responsibility center is one of those components and there are no hard and fast rules for deciding which portions of DP activity need to be set up as such centers.

But, he said, there are three broad categories of work that can be subdivided into unique responsibility centers. "Routine" labor works with data entry, processing and output functions, while "nonroutine" labor encompasses the professional DP staff. The third category covers the work done by the equipment itself, Sherer explained.

Once the centers are identified, the next step in the development of a cost-control system is the association of costs with the activities within the centers, he said. Costs are either direct or indirect, he noted, and assignments can become confused when a particular user has dedicated resources.

Measuring activities' performance provides an indication of how much work was done by each responsibility center. Many of the activities are easily definable and measurable, but others – particularly those done by the nonroutine labor force – are less clear, he acknowledged.

But, one way or another, they can finally be isolated and computed, he said.

The final piece of the puzzle leading to a coherent cost-control system is setting rates for the various activities. Sherer reminded the CMG session that systems might be built around either actual or standard rates; actual rates might seem more reasonable, he admitted, but standard rates normally lead to more consistent billings.

That tends to make that approach more acceptable to the end user, he added.

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Illinois Inviting Citizens to 'Beat Bum Rap Sheets'

By Catherine Arnst
Of the CW Staff

CHICAGO – If you live in Illinois and think you've gotten a bum rap, the state's Law Enforcement Commission is willing to help you beat it.

Illinois has circulated posters and brochures telling persons with arrest records how to go about inspecting and if necessary correcting both the computerized and paper criminal history files kept on them.

Since the program was started March 15, approximately 80 files have been requested and 75 were found to have errors, according to Art Loos, systems superintendent of the Illinois Bureau of Identification.

To check an arrest record, a person must identify himself at any police station or sheriff's office and fill out a "Request for Access and Review." A fee of not more than $10 can be charged for processing the request.

Challenges on Errors

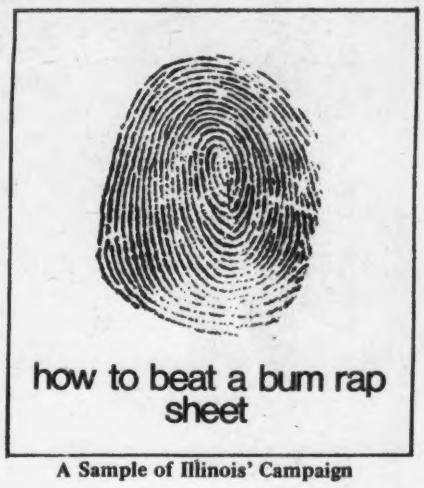
Within six weeks, written notice of an appointment for inspection of records is sent, and the person returns to inspect the record. If any errors are found, the individual can file a "Record Challenge."

If the application is denied, an administrative review can be requested. If still not satisfied after this procedure, an individual can file an administrative appeal with the Illinois Criminal Justice Information Systems Council. The council's decision is final unless a civil suit is filed.

Statewide Terminals

The Bureau of Identification maintains 1.8 million records on 100,000 people in its criminal justice information system. Records are corrected and updated through any one of 32 Incoterm terminals located in police stations throughout the state, Loos said.

At the end of October, the state began systematically purging from its files all records on people 70 years or older who have not had an arrest in 10 years; this procedure will take about three weeks, he said.



A Sample of Illinois' Campaign

Beleagured Bill for Mass. Justice System Signed

By Nancy French
Of the CW Staff

BOSTON – A bill authorizing $250,000 for the next phase of this state's computerized criminal justice information system was signed by Gov. Michael S. Dukakis here recently after a year-long struggle that threatened to delay the project indefinitely.

The bill was originally proposed as an appropriation to match federal Law Enforcement Assistance Administration (LEAA) funds on a 90%-10% basis.

The measure was defeated by this state's cost-conscious legislature, but after Dukakis and Attorney General Frank Bellotti got behind it and the system was thoroughly explained to the legislators, it was passed, according to Frank Keefe, systems engineering director for the Massachusetts Committee on Criminal Justice.

Specific Costs Cited

The bill approved by the legislature provides a very specific appropriation to be paid out of the capital outlay budget – a measure legislators were able to come to grips with, Keefe said. It allocates state funds for 50% of the cost of new work at the computer site and 10% for renovation, he explained, and contains actual bid information provided by contractors.

Despite the setback that threatened to kill the project, conversion of criminal records never was discontinued, Keefe said, although he was unable to estimate what percentage of the records have been converted to date.

Effective Half the Time

He did say, however, that when the criminal records data base goes up it will be able to respond to about 50% of the inquiries police will make. Within two or three years, that percentage will edge up to 80% or 90%, he added.

"It's been a hair-pulling, teeth-pulling type of effort" – not because people objected to the concept, but rather because of a problem with constitutional separation of powers between the state's three branches of government, he explained.

The problem goes back to a ruling by the state's Supreme Judicial Court which stated that any management data furnished by the courts could not go to an executive agency to be manipulated, he said.

While about 48 of the 50 states maintain criminal justice information within the executive branch, Massachusetts criminal records reside in the judicial branch.

After a statement of understanding was drawn up between the executive and judicial branches that defined how the data would be used and described how the Probation Central File was to be automated, the project began to move forward.

The criminal justice system is still a long way from completion, Keefe said. The $250,000 appropriation "will give us somewhere to put the Burroughs B-6700 system while programming work is completed by Data Architects, Burroughs' subcontractor in the project," he added.

The system is expected to be up and running with acceptance tests completed within about 18 months, he said.

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Mass. Makes Move in Haste, But May Soon Repent in Leisure

By Nancy French
Of the CW Staff

BOSTON – Massachusetts officials who moved the state's tax computer from a shared DP facility to function as a dedicated system to comply with "pending tax legislation" may soon find they acted in haste.

Neither the Tax Reform Act of 1976 nor the Internal Revenue Service (IRS) regulations that will implement it will contain new confidentiality requirements, according to congressional and IRS spokesmen.

The computer was moved at a cost of $20,500 when Tax Commissioner Owen L. Clarke was told by a congressional employee that confidentiality provisions contained in the Tax Reform Act could not be met in a shared DP facility.

The rules in question were those written to protect the confidentiality of federal tax return data the IRS provides on computer tape to states to help them locate residents who don't file state tax returns [CW, March 29].

In jeopardy was an estimated $10 million generated from such delinquent taxpayers, officials confirmed.

Although the computer had been moved to the central site only a few months before from a location where it had functioned as a dedicated system, it was moved back without waiting to learn what the ultimate IRS regulations would be.

Consolidation Urged

The story began some months ago when a report from a Management Task Force appointed by Gov. Michael S. Dukakis recommended consolidating the state's DP facilities. The consolidation measure, aimed at saving money in this revenue-starved state, was considered by the previous administration but tabled for reasons that were not explained, according to Roger Banville, director of the central DP facility.

The state's Univac 1100-10, which was being operated in the Tax Department, was ordered moved to the central facility by Administration Secretary John R. Buckley. There it would continue to be used for tax processing, but excess machine time would be used for other state functions.

Then Clarke learned from a staff member on the Joint Committee on Internal Revenue in Washington that the Tax Reform Act might affect these plans. The bill contained a clause permitting states "currently" sharing computers to continue to do so as long as Treasury Department regulations were observed, but did not mention anything about states that might wish to consolidate their DP operations in the future, Clarke explained.

The staff member interpreted the language as meaning that although states already sharing a system could continue to do so, states that were not would be prohibited from beginning the practice, Clarke explained.

Didn't Wait For Regulations

On the strength of that interpretation, according to Clarke, the decision was made to move the computer back, although the bill had not yet been signed nor had any IRS regulations been issued.

An IRS spokesman whose job it is to draft regulations to implement the new tax bill called the interpretation "incorrect." The rules, to be issued soon, will contain the same confidentiality safeguards presently in force for shared facilities; no dedicated systems will be required, he said.

Confidentiality rules presently permit states to use IRS exchange tapes as long as state tax department employees are present at all times during processing, the IRS spokesman explained.

As a result of the move, the state's central DP facility was stripped to only one system – a batch-oriented RCA Spectra 70/65 – to process all budget work for the controller, civil service personnel records and statutory retrieval for the legislature, to name only the major jobs, according to Banville.

While the Spectra 70 has communications and remote job entry capabilities, the data must be batch processed at night to update the files, he noted.

Short of computer power, DP officials have begun a search for a new system with data base capability, Banville said, adding "we've already had one meeting with the vendors and we're in the process of getting functional specs together so we can get the bids out by the end of the month."

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World rank as DP market: *Fourth*
1975 DP expenditures: *$2.7 Billion*
1975 imports from US: *$270 Million*
Rank as importer from US: *Third*

Computer Management is a monthly magazine recently purchased by Computerworld, Inc. Monthly circulation is 30,000.

COMPUTERWOCHE
Germany

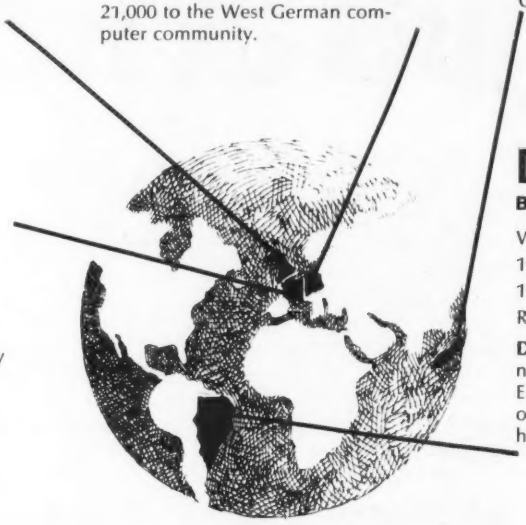
World rank as DP market: *Third*
1975 DP expenditures: *$3.7 Billion*
1975 imports from US: *$274 Million*
Rank as importer from US: *Second*

Computerwoche is a weekly tabloid newspaper started by Computerworld, Inc. It has a circulation of 21,000 to the West German computer community.

SHUKAN COMPUTER
Japan

World rank as DP market: *Second*
1975 DP expenditures: *$4.6 Billion*
1975 imports from US: *$189 Million*
Rank as importer from US: *Fifth*

Shukan is a weekly tabloid newspaper, jointly owned by Computerworld and Dempa publications. Circulation is 35,000.



Zero-Un Informatique
France

World rank as DP market: *Fifth*
1975 DP expenditures: *$2.5 Billion*
1975 imports from US: *$223 Million*
Rank as importer from US: *Fourth*

Computerworld represents **Zero-Un Informatique** in the U S Zero-Un has three publications, one a weekly tabloid newspaper with circulation of 22,000, the second a monthly magazine, circulating 13,000 copies, and a new bi-weekly, Minis and Micros. All circulate throughout Europe's French speaking computer market.

DATANEWS
Brazil

World rank as DP market: *12th*
1975 DP expenditures: *$250 Million*
1975 imports from US: *$60 Million*
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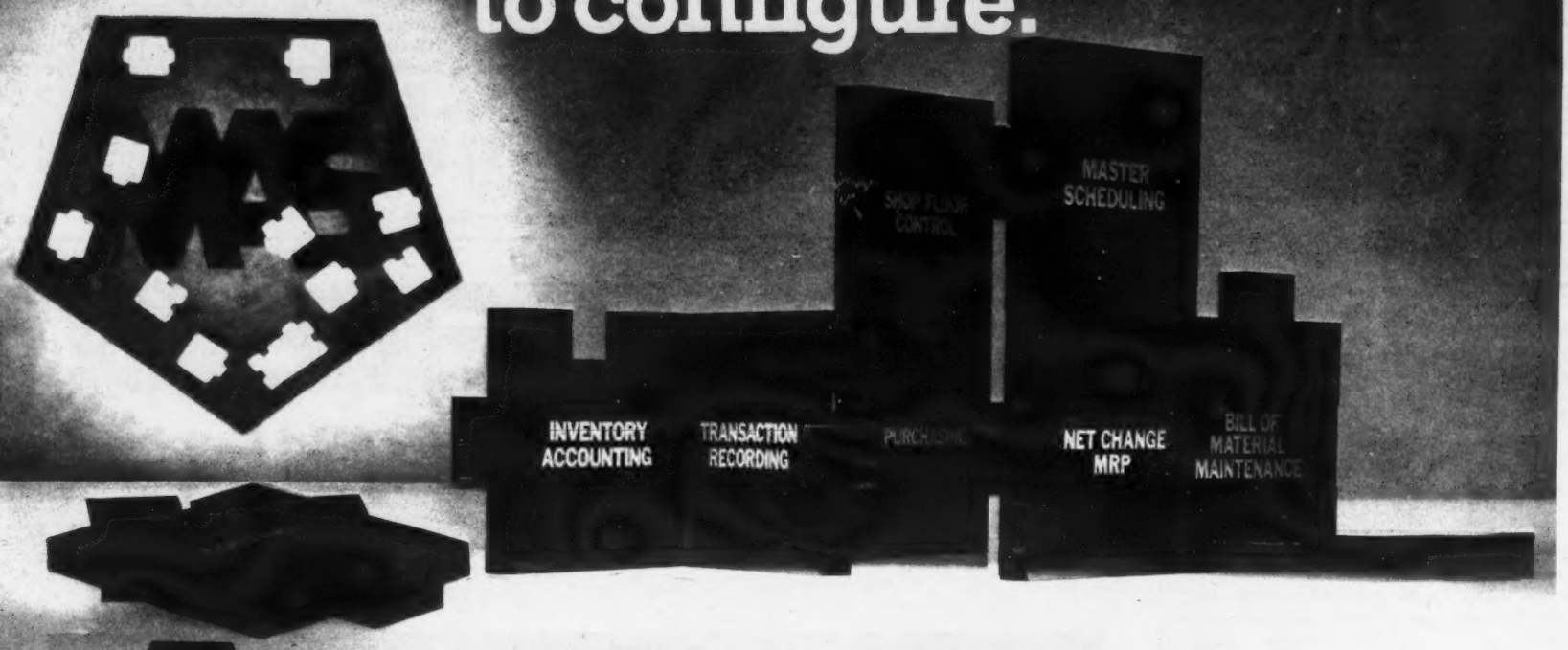

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Employee Motivation Seen Key To Outcome of DP Projects

By Ann Dooley
Of the CW Staff

CHICAGO – Unless workers on a DP project are motivated to do their jobs, the project itself will suffer or even fail, speakers at Info '76 agreed here recently.

Management style is the way "of getting your people to do the things you want" and, in order to achieve that, management has been turning toward the behavioral sciences, according to Lemuel Jones, an IBM instructor.

The Human Connection

Citing the theories of several behaviorists who contend people are motivated by various needs, Jones said it is up to management to encourage the fulfillment of those needs.

Behavior is closely linked to the job environment in several ways, Jones noted. People have various wants and needs; and as each level of need is satisfied, it is no longer a motivating factor, he explained.

Each level becomes more sophisticated; the last level is the need for self-actualization – living up to one's potential, according to Jones.

In relation to a work situation, this means the need for more job challenge and fulfillment, he explained.

Self-image is the most important force for actualization, Jones said. "Once managers realize workers have a self-image, they will do a much better job of managing them," he contended.

The role assigned to each worker should equal his self-image, Jones said. It is just as defeating to assign an unimportant task to someone with a high self-image as it is to assign an important task to someone with a low self-image, he added.

Encouragement or training from management might be required to build up an employee's weak self-image, he said.

A worker's self-image will promote a self-fulfilling prophecy, according to Jones. If an employee thinks he does a good job, he will do one; the expectation he, or his boss, has of himself will lead him to act accordingly, Jones explained.

Many managers still believe in the "Kick in the Pants" (Kita) theory of motivating employees, while others reward them with fringe benefits, but neither really motivates an employee to work better, Jones said.

A Pittsburgh survey showed achievement and recognition made workers happy while an increase in salary or fringe benefits only made them less unhappy, he noted. "Job enrichment doesn't mean more things to do; instead, it means changing the quality of the job."

Managers can improve work situations by encouraging workers to achieve their full capacity, by getting more feedback on management style, by delegating more responsibility and by implementing career planning and counseling, Jones said.

User Standpoint

Lloyd Epstein, manager of education for Cogna Systems Corp., approached motivation from a user standpoint, saying what is needed is total commitment to user involvement.

A project to put terminals in every installation of Swift Co., a meat processor, included feasibility studies, hands-on training for each person and extensive follow-up with the people at Swift. Two-way communication was encouraged and every effort was made to closely involve the client in the conception, design and implementation processes, Epstein said.

"The company felt the pride of ownership, which is a high motivator, and the client involvement created a commitment to the project," he recalled.

A mindful management is one which thinks about what people want, Ed Musselwhite, vice-president of Deltak, told the audience. "If there is no positive attention, they will accept negative attention; it goes on daily in industrial sabotage and projects which are endlessly delayed for no apparent reason," he said.

Emery Freight is a company that used positive reinforcement with dramatically successful results, according to Musselwhite. Instead of using the Kita philosophy, floor managers were told to praise and encourage the work of each individual.

Within a day, waste was significantly reduced and profits began a continued climb, he said.

MIT Jilted IBM, Trial Told

By Catherine Arnst
Of the CW Staff

NEW YORK – When MIT needed a more powerful computer for Project MAC, a time-sharing system brought up in the mid-1960s, it purchased a system from General Electric (GE) rather than IBM despite IBM's gift of a free computer some years earlier, according to Philip Morse, MIT professor emeritus.

In testimony at the U.S. vs. IBM antitrust trial here recently, Morse, director of MIT's Computational Center from 1957 to 1967, said he proposed IBM donate a 704 vacuum tube computer along with maintenance as "mutually advantageous to both of us."

The corporation saw other advantages in gratis installations at universities, trial documents entered earlier by the government showed. Free installations were believed valuable because they exposed management people to IBM computers at universities that had cooperative programs with the industry.

In addition, IBM assumed that, by offering equipment gratis, it would be in a preferred position with the receiver. A gratis installation at the University of Illinois had proved that assumption correct when the school later purchased more IBM equipment.

MIT, however, did not live up to IBM's expectations. When the school began Project MAC, it wanted a duplicate of its computer center system.

It needed a more advanced machine, however, and IBM was not far enough along in time-sharing developments to offer one, Morse testified.

IBM was "shocked and chagrined" that "any part of MIT would get a machine other than IBM's," Morse said.

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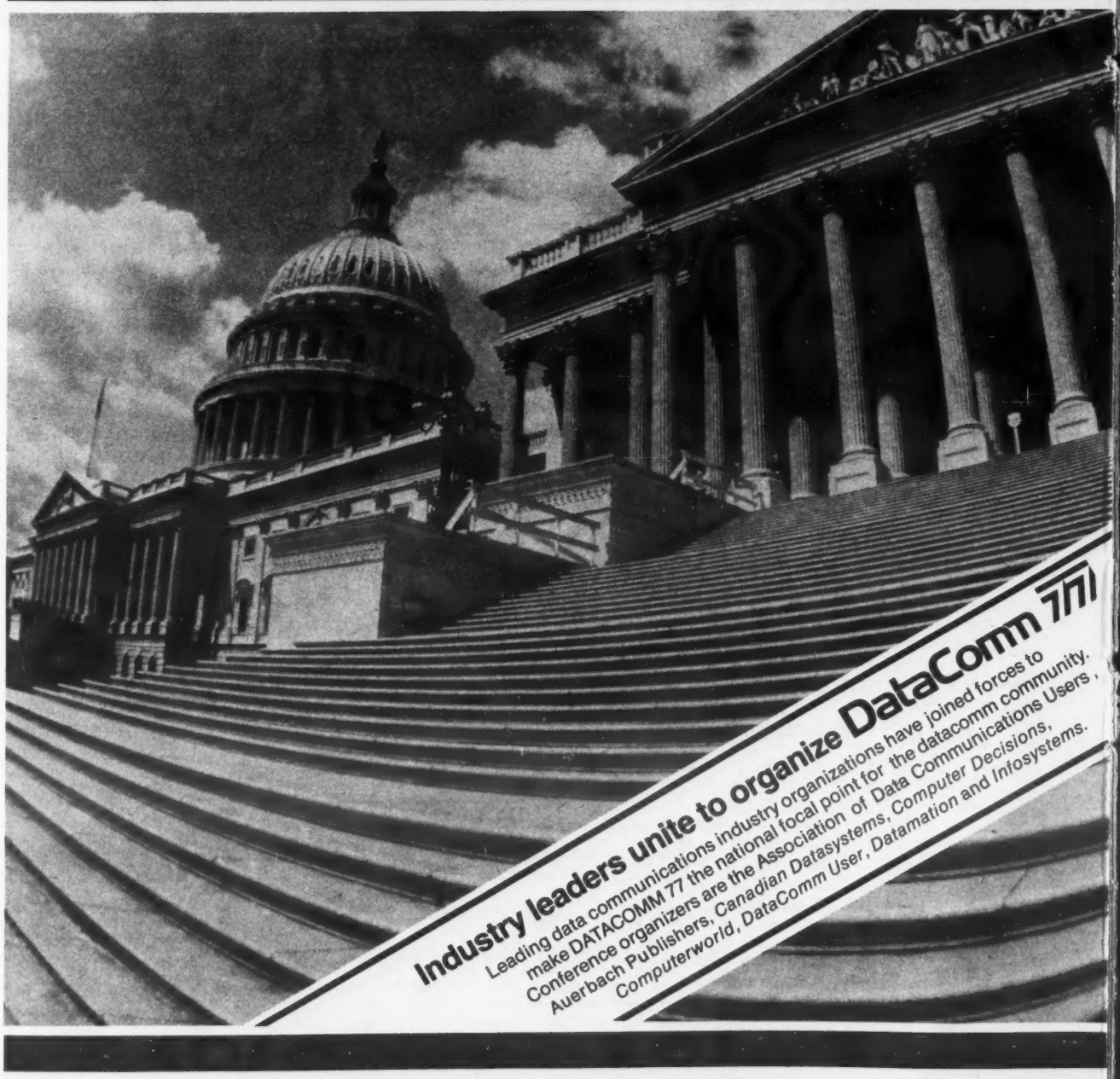
Industry leaders unite to organize DataComm 77
Leading data communications industry organizations have joined forces to make DATACOMM 77 the national focal point for the datacomm community. Conference organizers are the Association of Data Communications Users, Auerbach Publishers, Canadian Datasystems, Computer Decisions, Computerworld, DataComm User, Datamation and Infosystems.

DP Hit for Ignoring Corporate Decision-Making Needs

By Nancy French
Of the CW Staff

CHICAGO – The DP community has historically focused its attention on the current status of information and devoted very little attention to the information needed by top management for "strategic decision making."

Most management information systems (MIS) are only operating information systems – they tell what happened yesterday and what's happening today instead of what will happen tomorrow, according to Paul Schneider, vice-president of A.T. Kearney, Inc., a Chicago management consulting firm.

"Instead of focusing on what the cost impact of proposed legislation will be, for example, the typical [MIS] answers questions like 'How many orders did we receive yesterday?' and 'When do they have to be shipped?' " Schneider explained.

Orders are very important, but there will be no orders if management doesn't have access to information that answers questions like what impact new technology is going to have on the product line, he pointed out.

Other critical questions on the minds of top management include how changes in the equity market and the interest rate, for example, will affect the company's operation in the future, he said.

Equally important are answers to the questions raised by changes in competitors' product lines, he added.

Today's corporate executives are concerned about MIS because of the profit impact, but they don't like to turn to DP to get that information because DP doesn't have the answers, he told attendees.

Conceding that management is to some extent an art, Schneider said many executives can make decisions with less than the necessary information.

The artistic manager often functions well without the information he needs. Even if provided the information one would think he needs, the talented manager often chooses not the first choice suggested by a forecasting model but, rather, the fourth or fifth choice because of factors that cannot be quantified, Schneider indicated.

Assisting Top Management

Nevertheless, more can be done with DP to assist top management, and DP managers should urge their corporate higher-ups to invite them into the planning process – to let them know what information they will need to develop overtime so the DP department can avoid trying to throw together an MIS on a crash basis, he said.

The information management function still isn't being handled today; it's a future frontier, an opportunity, Schneider said.

The DPer of the future will know where to get the information his management will need to maintain flexible management objectives and to improve productivity in times of a capital crunch.

The DPer of the future should be able to help management recognize and exploit new areas of growth and anticipate changes in the economic system, he said.

Further, the DP department should be called upon to provide information that will assist top management in adjusting services to the changing demands of areas served by the company as well as help management take advantage of new products and new market opportunities, he said.

"Most of us grew up with the idea that the higher an individual was in the management structure, the less information he needed. This inverse relationship doesn't always work," Schneider said.

A DPer should be in tune with the personality and management style of the individual at the top of his firm, he said.

If he wants to know how many playpens are being purchased for the company's new day care center, the information provider must be able to provide it in the form he wants, Schneider concluded.

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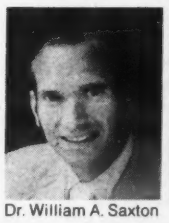
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Bureau Negotiating To Stay in Business

OKLAHOMA CITY, Okla. – Losing a $30,000 per month account and owing $300,000 on a Honeywell 3200 may force Academy Computing Corp. here out of business.

The service bureau was doing $800,000 in business annually until January when Bellstar, an order tracking system it operated for AT&T, went in-house.

The system consisted of 250 terminals in 10 states and used 80% of Academy's computing power, according to Dr. James R. Sherburn, Academy's president.

Academy had been operating Bellstar since 1968. During last year's recession, however, AT&T decided it could operate the system cheaper itself, Sherburn said, adding he disagreed with AT&T.

AT&T accomplished the changeover in six months, leaving Academy with a large computer it didn't need and couldn't afford.

Honeywell, however, refused to renegotiate Academy's contract unless the vendor had a secured note guaranteed by a director of the service bureau. Sherburn said such a note cannot be provided.

The firm was officially placed in default by Honeywell early last month and the two companies started final negotiations about two weeks later. If no agreement can be reached, Honeywell will repossess the system and Academy will be forced to liquidate.

"Honeywell is not trying to put us out of business. It's merely a financial consideration," Sherburn said. "There are a lot of computer companies out there in our situation, I guess."

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Taxpayers Sue School District Over 370 Acquisition

By John P. Hebert
Of the CW Staff

CONCORD, Calif. – The Mt. Diablo Unified School District may have to give up its IBM 370/125 if taxpayers here win a class action suit filed against the school district.

Scheduled for a hearing Jan. 17, the suit charges the 370/125 was obtained to replace an IBM 1401 without competitive bidding and with funds raised for another purpose.

Stuart A. Safine, attorney for the taxpayer plaintiffs, said the school's 1973 request for proposal (RFP) described the system from IBM 370/125 specifications.

Further, the funds used to purchase the system came from a 1968 $25 million bond measure intended for "supplying equipment or apparatus of a permanent nature" for the school building and grounds, not for the purchase of a computer system, he said.

Smith vs. Mt. Diablo Unified School District et al. was brought by Jerry Smith in May 1974 on grounds of misuse of the 1968 bond money [CW, July 17, 1974].

The case has bounced back and forth between courts here for the past two years on technicalities. In December 1974, a superior court judge threw out the case, stating Smith hadn't filed the suit before deadline.

But last March, the California Court of Appeals ruled the time limit doesn't apply to public agencies sued by taxpayers.

Officials Denied Information

In the suit, Smith alleged he sought information on the bid proposal in 1974, but school district officials "wouldn't give him information on how they based their [purchase] decision" or give him a copy of the contract, Safine said.

"They wouldn't show him anything." Smith, who is just "an interested taxpayer, screamed and yelled" and brought the case to court, the attorney added.

Although there is no suit against IBM itself, the suit asks IBM to take back the 370/125 and refund the $565,229 purchase price to the school district. Safine said he is also hoping to recover some of the maintenance costs incurred by the school district's DP center over the past few years, but that is not the object of the case.

During the discovery portion of the suit, the court found a Sept. 5, 1972 letter sent by James Merrihew, superintendent of schools at the time of the system's purchase, to IBM salesman James Obendorf asking him to place a 370/135 on order unless a Model 125 would be available before the requested delivery date, Safine said.

The IBM salesman is alleged to have given the school district's DP manager a specification sheet for the Model 125 configuration and to have asked that the IBM name and model numbers be dropped from the RFP.

Bid proposals from Burroughs Corp., Honeywell, Inc. and Univac were not considered because they could not meet the specifications set forth, including the delivery schedule, according to Safine.

Vendors and lessors of computer mainframes who bid on the system later wrote to the school saying it was clear the school district obviously wanted an IBM system, he added.

'Wired From the Beginning'

IBM installed the system and had it operating seven days after winning the contract, according to the taxpayers' attorney. IBM had specified a 10-day delivery schedule in its bid proposal, while the other three vendors submitted delivery dates of six months to one year, he said.

During the discovery portion of the suit, it was also found IBM had built the system for the school district before the RFP was issued and was merely waiting for the contract to be awarded, he said.

In addition, it was found the school district redesigned the computer room to accommodate the 370/125, Safine said, adding "I feel we can prove this thing was wired from the beginning."

And, he noted, school district officials admitted in the pretrial deposition it didn't need a machine with the computational capabilities of an IBM 370/125.

"We only want to get the school district's money back. We don't want to go after anybody in particular, or IBM for that matter," Safine said.

IBM Scientists Develop 'Supervacuum'

YORKTOWN HEIGHTS, N.Y. – As electronic circuits become smaller and smaller, new techniques are needed to apply ever thinner layers of materials to chips that will form the computer components of the future.

Scientists at IBM's Thomas J. Watson Research Center here have designed and built a vacuum chamber that enables them to form and study layers of material as thin as one atom, according to an IBM spokesman.

The chamber, which measures one cubic foot, is large enough to hold several experiments in a vacuum that approaches the emptiness of interstellar space, according to IBM.

The "supervacuum" is achieved by cooling the chamber to only a few degrees above absolute zero.

Observing Changes

To make computer chips effective, the thin layers of circuitry must be preserved over extended periods of time. In a test situation, scientists must be able to observe these layers and any changes that occur in the layer's electronic properties, according to Dr. William A. Thompson. In a normal vacuum chamber, the surface layers don't stay the same long enough to get a good analysis, he explained.

The supervacuum chamber enables researchers to do experiments over a two- or three-day period and then preserve the surface and analyze it again a month later, Thompson said.

Although the chamber runs at very low temperatures, it contains a unit hot enough to melt and evaporate materials such as lead onto test surfaces.

"One of the advantages of the chamber is that we can evaporate slowly without worrying about contamination. We get very good thickness control and surface longevity," Thompson said.

Designing the evaporator was one of the major tasks in the development of the IBM vacuum chamber. To preserve the low pressure of the chamber but, at the same time, allow the evaporator to function at a high temperature, it was necessary to surround the evaporator with four heat-insulating shields – two inner shields of tantalum and two outer shields of copper.

The chamber usually stays sealed for several months, during which many experiments are performed.

MISSISSIPPI STATE CENTRAL DATA PROCESSING AUTHORITY

Sealed proposals will be received by the CDPA, 508 Robert E. Lee Bldg. Jackson, MS, 39202, up until 2:00 p.m. 12-20-76 for the following data processing equipment:

Request for Proposal No. 267 for the purchase of a microcomputer with graphics display capable of communicating with an existing DEC 1077 computer system.

Request for Proposal No. 268 for the purchase of an impact printer capable of interfacing with a Univac Uniscope 200 terminal.

Request for Proposal No. 269 for the lease or purchase of a software package that will edit in detail vehicle identification numbers (VIN) for both foreign and domestic vehicles.

Request for Proposal No. 270 for the lease or purchase of a central processing unit upgrade to replace two existing IBM 370/155 systems to include either a multi-processor (MP) 158 system and sale of 155's or an attached processor (AP) 158 system, sale of one 155 and purchase of a DAT (Dynamic Address Translation) feature for one 370/155.

Detailed specifications may be obtained from the CDPA office. The CDPA reserves the right to reject any and all bids and proposals and to waive informalities.

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With DP Performed at the Source

Future Shops Seen Coordinating Distributed Processing

By Nancy French
Of the CW Staff

CHICAGO – The typical DP department of the future will function as an internal consultant and coordinate DP efforts being undertaken by line departments, according to W. Harry Vickers, vice-president of Entrex, Inc.'s Market Development and Support Division.

In such an environment where processing is done "at the source," the data base administrator will specify the format of key data elements in all source data processing systems and will also specify the format of all intercomputer data transfers, he predicted.

Vickers urged DP managers as well as top management to be prepared. "If you wait until source data processing sneaks up on you, you'll end up with a hodgepodge of equipment with no one place to go for knowledge about overall operations" and with little flexibility, he said.

Distributed Processing Trend

Many trends already favor a move to distributed processing, Vickers told attendees at the recent Info '76 conference here.

Hardware cost has been in a very steep decline for a number of years and that trend is likely to continue, he said. The microprocessor has brought about dramatic cost improvements and over the next few years will produce considerable speed improvements, he added.

The advent of semiconductor memory has pushed down the prices of all forms of main memory, and disk storage costs have dropped by a factor of 25 since 1970. Data communications costs have also dropped, although not nearly as dramatically as computer hardware.

These declines are occurring in the face of labor costs which are rising an average of 8% to 10% annually, he pointed out.

"In many places it is hard to find, train and keep quality people. The economics are saying: 'Use more hardware if it will save labor or if it will make labor more efficient or more effective," he said.

People are growing more comfortable with the computer, he added, noting students are taught programming as a standard subject in most high schools and colleges. Further, with the maturation of software, minicomputers have many of the features only a mainframe had just a few years ago.

Another factor in the trend toward distributed processing is the movement to profit-and-loss-oriented department management, Vickers said. When a department manager becomes "sensitive to profit," he begins to look for tools to make his operation more efficient, he explained.

Insistence on Simplicity

The company president faced with a proposal for distributed processing should insist on simplicity so he, as well as the auditors and line managers, can understand it on more than a superficial level, Vickers said.

While it's not necessary to know how to program a whole application, line managers should know how the application works and how the data is structured so they can determine which questions will be easy to answer and which will be difficult, he explained.

A line manager might want to know something he thinks is simple, such as the top 10 overdue accounts, the 10 largest orders for the week or the 10 employees with the highest absenteeism rate, he suggested, adding this type of question will come up many times but usually "after the application is programmed."

It makes little difference to the manager if the page has a nice heading or the spacing is neat or even if he gets more than 10 names. He wants the information and he usually wants it fast, Vickers said.

There are source data processing systems today that will provide 95% of the functionality of a mumbo-jumbo system, but with a structure that can be explained to a non-DPer in terms of three concepts: a file, an index and a transaction, he said.

As for DP managers, Vickers recommended they regard source data processing "as an opportunity, not a threat." Some seem to be afraid it will put them out of jobs, he noted.

DPers should plan carefully and, as the first project, "distribute something that shows very tangible progress in a very short time."

Vickers also suggested involving the line departments in programming some of the reports. This will not only give them the ability to generate follow-on reports, but also increase their enthusiasm, he said.

FAA Upgrading Traffic Control System

SILVER SPRING, Md. – In an effort to improve its Enroute air traffic control system, the Federal Aviation Administration (FAA) is implementing additional software with upgrades done by Computer Sciences Corp. (CSC).

These features include a "flight plan probe" which automatically compares each flight plan with all others entered in the computer. The first aircraft to claim space will have precedence over the later entries.

"Conflict resolution" is a program to handle flight plan conflicts. Air traffic controllers will be able to view a display screen to compare possible solutions to conflicting demands for air space and reroute aircraft where necessary.

The controller might inform one pilot to reduce speed or altitude until a conflict has passed, according to a CSC spokesman.

A third capability is "command message automation," a nonemergency means of delivering routine messages from controllers to pilots through computerized voice or teleprinters.

The last feature will be "enroute traffic metering" to compute and improve the timing of aircraft arrivals at busy airports and adjust the flow of traffic into an airport.

These capabilities will enable the Enroute system to better utilize existing computers and avoid the expense of new equipment while increasing safety, especially near busy airports, according to Arturo Silvestrini, president of CSC's System Sciences Division.

The CSC software was designed to interface with the computers of the FAA's automated terminal system to optimize maneuver time and holding patterns that contribute to flight safety and fuel savings, Silvestrini said.

The initial safety features will cost taxpayers about $1.5 million, CSC said.

Anti-Puncher Defeated In Recent Election

Special to Computerworld

SEATTLE – A candidate who proposed to "abolish the punch-card voter system" in the state of Washington went down to defeat in the recent election.

Bob Corcoran, a Democrat running for Secretary of State, had called the computerized election procedures now used by 45% of Washington residents "dangerous and error-prone." He cited 1975 election results in which "one county's figures were totally wrong with a two-day lag in correcting the results" and in which "34,785 votes were not tallied in 12 other counties."

Despite Corcoran's charges, election officials have found punch-card voting to be no more "dangerous or error-prone" than voting on lever machines or with paper ballots.

The punch-card voting issue was the sole plank in Corcoran's platform, according to the official state voters' pamphlet. Victorious candidate Bruce Chapman, a Republican and the incumbent, did not mention the issue in the pamphlet.

The only other candidate for Secretary of State to submit a platform, Lucie Griswold of the Owl party, passed over the punch-card ballot issue in favor of opposing "bed wetting" and "postnasal drip."

The history of punch-card use in Washington, which began in about 1971, has been marred by such incidents as the resignation of the Superintendent of Elections for the state's most populous county in 1973 because of the "tension and pressure" created by the system.

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Editorial

Promise and Peril

The recent introduction by IBM of its Advanced Communications Function (ACF) [CW, Nov. 15] puts an entirely new perspective on the company's Systems Network Architecture (SNA).

Up to now, SNA capabilities were limited to single-mainframe systems supporting terminals in various network configurations. Using the benefit of its flawless hindsight, IBM now reveals these systems really were single-domain networks.

The significance of a single-domain network is important only as it relates to the multiple-domain network. And with the introduction of the latter term, IBM finally unveils the first major concept that helps to explain what SNA is all about.

Bearing in mind that some of these latest concepts remain to be demonstrated, IBM now reveals the ACF framework will allow terminals in one CPU network to access applications programs from a "foreign" CPU network.

In other words, terminal domains can be defined which span multiple mainframes and, as long as a terminal is duly authorized within the predefined limits, it will be able to access a number of CPUs.

These so-called "cross-domain connections" will truly expand the networking capabilities of IBM teleprocessing users. And the multiple CPU network concepts appear to set the stage for data communications users who will be accessing multiple network facilities to access multiple data bases at distributed DP sites.

The IBM announcement holds much promise together with an unusual amount of caution to be carefully heeded by users.

Until now, the SNA architecture has been an underwhelming success. This is mainly because IBM created an immensely complex operating environment which includes significant cost and configuration upheaval for those users that choose to implement it.

Previous SNA implementations have encountered a rocky road because many of the capabilities were announced before they were truly perfected. There are still precious few large-scale networks operating under SNA with IBM's Synchronous Data Link Control.

The ACF capabilities are the most impressive to date. They will become available next year. And if they operate as smoothly as advertised, the days of distributed data base networking using dispersed terminal subsystems and multiple CPUs will have taken a significant step forward.

It will be very important for users to carefully monitor additional technical details as they unfold from IBM. It will also be very interesting to see how soon there are test sites implementing the new SNA concepts on a large scale.

It could be very exciting.

Letters to the Editor

Schechter Showed Inventiveness And a Degree of Inaccuracy

In his article, "Storage of Data Information Lacks Inventiveness" [CW, Nov. 8], David Schechter has shown inventiveness, albeit inaccuracy.

His statement that centuries have 25 leap-year days was only partly correct, since century years not divisible by 400 are not leap years, e.g. 1900.

We have invented a date, dubbed Mega, which is the number of days since the beginning of the Common Era (A.D.). This is based on an assumption that the Common Era began on Jan. 1, 0000, according to today's Gregorian calendar.

July 4, 1976 becomes 721,905, which stores very nicely in four bytes, packed decimal. The Mega date transcends both years and centuries and can easily be used to calculate elapsed days and the day of the week.

Since the calculation to obtain the Mega date is a little complex, we use a subprogram to convert any of five date forms to any of six date forms, including Mega.

Larry Runtsch
Systems Programmer
Geo. A. Hormel & Co.
Austin, Minn.

Excellent Date Handling Method

David Schechter proposed an excellent method of handling calendar dates for the entire century. Hopefully, *Computerworld* will keep the idea alive by noting any pioneer applications.

Nonetheless, I strongly urge that Schechter's meaningless acronym, FDN (five-digit number) be replaced by DN (date number).

Kenneth K. Klingensmith
Cromwell, Conn.

Only Good for 23 More Years

David Schechter's article is commendable, but I believe his formula is only good for 23 more years.

I propose the following simple change to his basic premise: There are a fixed number of days in a 10,000-year period, namely 3,650,000 plus 2,500 leap-year days.

Thus, any date between Jan. 1, 0000 and Dec. 31, 9999 can be expressed as a seven-digit number (SDN).

SDN = (YYYY * 365.25) - .25 + DDD

In fact, an SDN would suffice for the years 0000 through about 27377.

Donald J. Ramig
Madison, Wis.

How Many Leap Years in 100?

It was the mistaken notion that there are 25 leap years in a century that led me to notice the error in David Schechter's five-digit number (FDN) formula.

For those concerned about the 21st century or truly archival data of this century, the correct formula is:

FDN = integer ((YY * 365.25) - .25) + DDD

With this minor correction, you will be easily able to determine the correct number of days that items from the year 1900 have been on backorder.

Edward C. Imperatore
New York, N.Y.

(Other letters on Page 16.)

Data Past

Five Years Ago
Nov. 24, 1971

LAS VEGAS – About 17,000 people attended the 20th anniversary of the Fall Joint Computer Conference in this city last week and 4,100 conference registrants participated in sessions on "Computers and the Quality of Life," the conference theme.

President Richard M. Nixon, in a telegram, congratulated the American Federation of Information Processing Societies, the conference sponsor, on the theme, noting it "reflects the challenge of the next 20 years."

– – –

LAS VEGAS – Potter Instrument Co. led the product announcements at the Fall Joint Computer Conference with a working plug-compatible IBM 3330 replacement drive that interfaced directly with IBM's 3830 controller. The disk storage system, the DD 4330, was cheaper and faster than its IBM counterpart, Potter said. The single-drive spindle was priced at $550/mo on a one-year lease and the cost of the double-drive version was $1,030/mo.

Eight Years Ago
Nov. 27, 1968

WASHINGTON, D.C. – A spokesman for the General Services Administration (GSA) told a congressional committee here that if the GSA did not receive cost data from the computer industry voluntarily next year, it would promote legislation to force the industry to provide it.

Lawson B. Knott Jr., GSA administrator of general services, said while the Truth in Negotiations Act called for the details to be provided, the computer industry refused.

– – –

WALTHAM, Mass. – A desk-top computer display which handled both drawings and characters was introduced by Computer Displays, Inc. Designed to operate over standard telephone lines, the Advanced Remote Display Station sold for $12,750. It was said to be the first desk-top system that had both assembly drawing and full-vector capability.

Against Long-Established Usage

Schechter Gave Incorrect Definition of the Julian Date

By Peter F. Klammer
Special to Computerworld

Does one call a programmer a computer? Or a card reader a processor? No, these words have particular meanings in the realm of DP jargon; they have not been just carelessly adopted.

It is one thing to assign more precise roles to words used in a field of work or even to invent a few words to match our newly invented concepts, but it is quite another thing to misuse existing language that already has well-defined usage.

That is why I take such strong exception to David Schechter's description of the term "Julian" date in the Nov. 8 *Computerworld*. The definition he gave is incorrect and runs against long-established usage in the scientific arena.

First Modern Calender

The back end sheet of this year's *Success* desk calendar explained the Julian calendar was "the first modern calendar" with a leap year, established in 45 B.C. by Julius Caesar.

Although it was "an enormous improvement over all previous systems," it ran a little slow, by about 11 minutes, 12.2 seconds per year or 3 days, 2 hours, 41 minutes and 20 seconds every four centuries.

Of course, this doesn't mean the sun gets further and further from zenith on successive noons, as would be the case if one's wristwatch were allowed to accumulate such an error.

Out of Kilter

What it does mean is that the system of counting days, months and years gets further out of kilter relative to the seasons – marked by the equinoxes and solstices.

Without a correction, the shortest day of the year would be Dec. 21, then Dec. 20 and so on, until a few millenia later the middle of the northern-hemisphere winter would occur during September or October, and Dec. 22 would mark the start of spring.

Gregorian Leap Year Rule

Sixteenth-century stargazers were able to measure this error and they gave us our current Gregorian calendar. A calendar correction "was done in 1582 by Pope Gregory XIII," skipping Oct. 5-14. (Imagine what that would do to your payroll system – and your third-shift operator bewails the loss of an hour when the clocks go off Daylight Savings Time.)

'I take strong exception to David Schechter's description of the term "Julian" date . . . The definition he gave is incorrect and runs against long-established usage in the scientific arena.'

To take up part of the error, the new Gregorian Leap Year rule provides for dropping a day from every centessimal year (ending in 00) whose number cannot be divided by 400.

That takes care of three days per four centuries, leaving something like one day per 4,000 years to be compensated for in the future; but it's quite likely the earth's rotation is slowing down enough that a new leap year rule will have to be instituted by then.

Note that not all the world adopted the Gregorian calendar at the same time. England and the American Colonies switched in 1752, by which time the error had accumulated to 11 days: Sept. 3-12, 1752 do not exist in the English-speaking world.

So even though it was Feb. 11 when George Washington was born in 1732, his birthday exactly 40 years hence was Feb. 22, 1772.

Since both the Julian and Gregorian calendars were in use simultaneously in different parts of the world," dates preceding the change are sometimes [suffixed] OS, for Old Style."

Adopted by Astronomers

Data processing folks were not the first to see the advantage of a day-numbering system that would allow easier calendar arithmetic. In fact, according to Van Nostrand's *Scientific Encyclopedia, Fourth Edition,* 1968, the term "Julian Day" refers to a system astronomers have adopted, "a system of chronological reckoning, using merely the mean solar day as a unit."

Further, "according to a system first proposed in 1582 . . . a date is expressed as the number of days elapsed since the beginning of an arbitrary 'Julian era', Jan. 1, 4713 B.C."

Astronomers go on to put decimal places behind the day number instead of stating hours, minutes and seconds. "Thus, an event occurring at 2 hours, 43 minutes, 34.6 seconds p.m., Eastern Standard Time, on Jan. 24, 1937 would be recorded as . . . J.D. 2,428,558.32193."

The decimal part, of course, is relative to Greenwich Mean Time.

Webster's *Third New International Dictionary*, 1971, concurred, defining the term "Julian day number" as "the number of a day in the Julian day calendar" (as 2,436,934 for Jan. 1, 1960).

Here a mystery arises: every algorithm I have found yields 2,436,935 for this date. I have checked four other references such as Van Nostrand's and I think it is simply an error. Off by one again.

'Day of Year'

What shall we call the YY/DDD notation, then? I would suggest "Year and Day of the Year."

The term "serial day" is ambiguous, leaving the question, "Serial within what?" "Day of Year" is unambiguous, and one can answer "What day of the year is it?" by looking at the lower left corner of a better desk calendar.

This terminology also fits well with "day of the week" and "day of the month" terminologies.

Many good algorithms have already been published in *Collected Algorithms From CACM and Communications of the ACM* to convert Gregorian dates to other date systems.

I prefer to use Julian dates unless I must be very stingy with space. A signed 32-bit integer will cover dates through nearly the 50,000th century, which is enough for almost any application but a Star Trek concordance.

Klammer is senior programmer/analyst at the Kansas City (Kan.) Department of Planning and Development.

Reader Commentary

With the New Role of the Auditor

DPers Must Get Ready Now for Real Data Base Life

The Taylor Report
By
Alan Taylor, CDP

When the National Bureau of Standards (NBS) was getting ready to publish NBS Special Publication 451, "Data Base Directions – The Next Steps," earlier this year, it had the delightful idea of showing the relationships between various areas by means of a jigsaw puzzle.

Regulations (which referred to government regulations and their impact) were shown as the chin and mouth – which appeared somewhat appropriate, all things considered. Technology was shown as the neck, on which everything else was based – which again was quite well thought out. Audit was allocated both the eyes and the nose – and that I found interesting.

Why a Nose?

It is easy to see why the eyes were allocated to audit operations. It looks at what is going on by inspection. This is its responsibility – and it requires eyes.

But why a nose? What is the symbolic function of the nose as seen by the NBS?

The answer came out in the audit part of the report. Here it was noted the auditors workshop reviewed problems which it felt will occur in the next five years.

The auditors did not simply look at the problems that are currently known; rather, they went ahead and sniffed problems that are not here yet.

The auditors were investigators here, rather than inspectors – and did a pretty good job of it too.

So the illustration of the auditors having the investigational smelling-out nose as well as the inspecting eyes was, in the circumstances, quite appropriate.

Auditors Looked Forward

In their investigation, the auditors noticed how fragile the data-based corporations were and how the increased concentration and reduced redundancy of data made it quite foreseeable that, owing to human error, a corporation could be simply wiped out.

They particularly rejected the concept that the chance of such a disaster wiping out a data base is so remote an auditor might not have the obligation to report any case where such a possibility existed.

More to the point, the auditors specifically differentiated the data base/nondata base situations at this point.

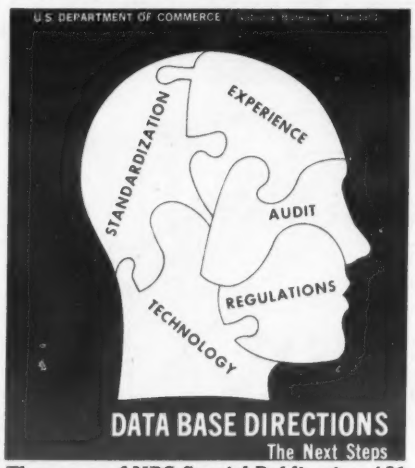
From their point of view, the move into data bases makes it apparently obligatory for auditors to investigate areas where they previously did not need to go – in this case, into the effectiveness of data base recovery areas.

From their statements, there was a consensus the depth of danger was such that the auditor would not merely investigate the matter, but would also have to formally report any danger situations – not just push the matter under the rug in some working-paper notation or comment about the advantages of stricter controls, tighter management, etc.

The panel listed various integrity considerations, which certainly go well beyond backup when someone sends all the disks to a laundromat or similarly destroys the material.

Security, accuracy controls and the quality of data held in the data base are all in the auditor's mind when the utmost scrutiny is necessary.

When data is recorded only once, this recording has to then be used for all subsequent use and the validation of the "initial step," i.e., the original entry, will have to be checked by the auditor as being as extensive as possible, the auditors pointed out. And that is going to cost more money, you can be sure.



The cover of NBS Special Publication 451 illustrates the new role of the data base auditor as investigator.

Similarly, the auditors called for the auditors to see that the data base has self-diagnosing capabilities to find inaccurate data. They want such a system to always include provisions for the system to internally evaluate and test its own accuracy.

Now, that is not present – nor does it need to be – in nondata base systems.

Read It Yourself

Read the report for yourself – and think about what it really means and what new aspects have added to current safeguards when a system goes data base.

After reading it, think about what it really means to prepare for the new environment. How many programmers or analysts know how to design input suitable for automatic self-diagnosis?

How many installations have sufficient control over new applications to ensure data that was originally accurate enough for all contemplated uses is not later used for a purpose for which it isn't properly edited?

That's a whole new operational standard for DP to live up to.

If half of this report is correct, we will have to review any ideas that we have on the true costs of conversion to data bases.

It is not like converting to multiprogramming or operating systems was because there the individual programs remained logically independent and any problems were effectively isolated. No longer is that true.

So now it is up to us to get ready for real data base life, not just the experimental efforts that appear to be data bases.

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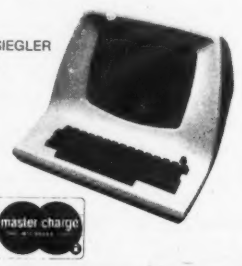
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Letters to the Editor

Honeywell Not Selling At Garage Sale Prices

Herb Grosch, in "DP Fairy Tale Has Three Dwarfs Left" [CW, Nov. 1], stated "Honeywell is having a garage sale." If this is true, Honeywell is certainly not selling its equipment or services at garage sale prices.

Now, I am no great lover of Honeywell management, but I do believe it has put out and is still putting out some very good and reliable equipment. I am very satisfied with the Honeywell equipment we have and am quite proud of the things we are doing with it.

In a previous column, "Into the Act" [CW, Mar. 1, 1976], Grosch said things were looking pretty good at Honeywell with the advent of Level 6. Now he completely reversed this position without explanation, which leads me to ask: Will the real fairy tale please stand up?

Michael P. Eiseman
Vice-President
Revere Electric Supply Co.
Chicago, Ill.

Mysterious Results in '89

David Schechter's five-digit number (FDN) technique [CW, Nov. 8], which we call day of century (DOC), eliminates end-of-decade problems such as the January 1970 disasters and reduces the end-of-century problems – January 2000 will be a good month to vacation in Antarctica.

However, using two bytes to store day-of-century dates in the IBM 370, as Schechter suggested, will produce some mysterious results around 1989.

IBM 370 binary arithmetic operations treat the high-order bit of 2-byte data as the sign of the number (0 for positive, 1 for negative). Only 15 bits are used for the magnitude of the number, giving a maximum of 32767.

It appears Schechter's will have negative dates after Sept. 17, 1989 (32767).

A full word (four bytes) on the IBM 370 permits a maximum number over two billion. Using a full word, you can set your base date to the first day of our calendar (the birth of Christ, if you will), and your date processing routines should remain valid for a long time.

Joseph W. Begasse
Consolidated Edison Co.
of New York, Inc.
New York, N.Y.

Say It Ain't So

The Social Security Administration said a new tape mounting and control system will save about $1 million per year [CW, Oct. 18]. As I interpret the figures, it looks more like $600,000.

The estimate was based on a study of the old system from June 1 to July 15 and on the new system from July 16 to Aug. 31. Both studies covered three daily shifts, Monday through Friday.

My problem is that there is no explanation of the holiday on Monday, July 5, during the old system study.

If no other day was used, the old system covered 32 days and the increase was 12.7 jobs per day, or about 66% of their figure.

Please tell me they're OK, I'm not OK, and make me a happy taxpayer.

Stephen D. Barry
Winchester, Mass.

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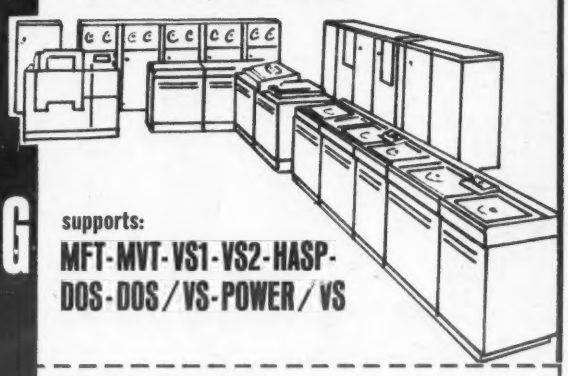

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CPEUG Keynoter Says

Microprocessor Revolution Changing Focus of CPE

By Don Leavitt
Of the CW Staff

SAN DIEGO – The problem faced by computer performance evaluation (CPE) is not being changed by the microprocessor revolution, but the point at which the problem is attacked is changing, according to Seymour Jeffery of the National Bureau of Standards.

Keynoting this year's meeting of the CPE Users Group (CPEUG) here recently, Jeffrey said CPE, "properly understood and applied," has always been concerned with finding better and more economical ways for users to satisfy their DP needs."

And the only way to do that, he added, is to understand the technology and to understand the application well enough to find a cost-effective fit between the available equipment and the need.

In the past and even today in working with general-purpose mainframes, "CPE has had to second-guess systems programmers, operators and applications programmers. In the future," he continued, with micro-based systems "we will probably find it more useful to second-guess the systems analyst and the systems designer."

Economics Doubtful

The economics of computing with microprocessors has begun to raise "considerable doubts" about the cost-effectiveness of end-user CPE studies "and these doubts are more likely to increase than to go away" as micros become more prevalent, Jeffery told the group.

Traditional CPE developed as it did because the physical size and environmental requirements of computer systems made it natural to bring the workload to the system, he noted. In turn, centralized CPU sites maximized both the ability to make changes and the potential for large payoffs in increased efficiency, he said.

"But what happens to this way of thinking," he asked, "when the 'natural' dynamics no longer apply – when, through lower costs and vastly reduced size, the computer goes to where the workload is, instead of the other way around?"

The implication of such a trend on CPE technology is "devastating," Jeffery said. The dispersion of computer power across a user community "would raise the cost of conventional measurements well beyond acceptable levels," he added.

Performance measurement and tuning came into prominence only after operating systems became "an art form" in the mid-1960s and end users "finally became convinced technology had truly left them in its tracks," Jeffery said in recalling the history of CPE.

Computers had always been fast, but early users saw them doing one recognizable workload step at a time. Multiprogramming operating systems changed all that by doing parts of several different tasks concurrently "in order to increase the utilization of an expensive CPU," he recalled.

The operating system itself grew and developed "an ever-increasing need for hardware resources" and, in time, CPE emerged as an attempt to unravel the multiprogramming mystery and impose "some measure of control" over a wasteful resource, he continued.

But now, with micros, operating systems may become completely unnecessary, Jeffery believes. "In contrast to the complexity of multiprogramming systems, microprocessors are models of regularity and simplicity," he said.

"Where multiprogramming baffled users, micros intrigue them: in place of the alienation that came from excluding users from the computer room, micros offer availability, convenience and familiarity," he added.

Without complex operating systems, the end user's need to measure hardware or software performance "virtually disappears." The need to build a good system, however, takes on added importance in micro-based systems that aren't expected to be tuned once they are in place, Jeffery said.

Good Design Seen Key to On-Line System

By Don Leavitt
Of the CW Staff

CINCINNATI – To get the most out of an on-line system, users have to design for performance and then measure the attained performance and make useful adjustments, according to a systems engineer for Cincom Systems, Inc.

Leading a technical session at the recent Knock-About, or Cincom users group meeting, Jon Waters said the design phase should be based on proven, efficient techniques.

But more important, he added, is the setting of goals for performance – the defining of exactly what is to be accomplished.

If those goals are in place, the performance measurement phase is straightforward. "Does the system match the goals? If not, where is the bottleneck?" he asked.

In any case, he added, "What is the expansion potential?"

Consideration Questions

Actually, Waters noted, the design phase has to take two things into consideration: What really must be done and how should it be done with the greatest economy of resources.

Here again, a series of questions illustrates the concerns the designer must have, he said.

Once the design is set, is it really what the end result should be? Beyond that, what are the future plans? he asked.

In terms of resources, what is the best way to do this? Will our methodology let us grow? And what is the most reliable and supportable method for meeting our goals?

In some plans, there are functions that would be better handled in batch processing; in others, functions laid out for single-thread handling might be done as a paralleled, overlapped task, Waters said.

Designers must determine if all the required functions fit into the time frame that is predicted, plus a pad factor, for good response and throughput.

A full analysis must be done, with inputs from all personnel – programmers, terminal operators, user management and DP management – in order to define the system, Waters emphasized.

Defining the performance goals is another two-step process, the systems engineer continued. The designer has to determine the nature of the required throughput and set goals appropriate to the application.

The goals are best defined in "units of work" terms. Then, by breaking down the units of work into components, a throughput potential or response time prediction can be made, he said.

Result of Design Efforts

Recognizing his presentation was heavily dependent on a lot of questions, Waters pointed out the net result of design efforts in which too few questions are asked might be a "wonderful system that has features no one ever uses" or "an immense amount of overhead for no reason."

Once concern for design has shaped a system that will do the right job, the concern must switch to doing the job right, he went on.

The designer has to make a wise choice of file types so as to minimize I/O accesses and data transmission requirements, he said.

Designers must recognize hardware layout is "critical" to performance, he said. The teleprocessing network must be balanced for even activity distribution, and this means using as many disk channels and devices as possible.

Users should try to keep master files on different disks, rather than on related variable files, to minimize seek times.

When sharing disks, related files should be located near each other, he added.

$295 Sort Handles Small Files

ANAHEIM, Calif. – A low-cost sort package from an independent software vendor here is said to gain its efficiency by being limited in its use to working with only small- and medium-sized sort assignments.

Files larger than 500,000 bytes just aren't handled well by the package, according to Bill Page, DP director for the Page Co.

Sorting is traditionally one of the major operations in a DP installation and Page got into its own development when packages available to it didn't seem to do the work as well as Page wanted, he indicated.

The problem appeared to be that all the packages were so generalized to work with all kinds of files and a variety of sorting demands that they weren't particularly good on any particular type of file, he explained.

At the end of its programming effort, Page had what appeared to be an "extremely efficient" in-core sort for small and medium amounts of data, he said.

At this point, Page claimed he thought he had failed, but he gave copies of the sort to a few users who had helped in the development effort.

Positive Reactions

The reactions were far more positive than he had anticipated, Page said.

Then he realized his own situation wasn't very different from others'. In his installation, as much as 75% of the CPU time utilized by sorting was devoted to precisely the small- and medium-sized jobs for which his coding had been tailored, he said.

"The only solution we could come up with," he added, "was to offer the program at a very low price [$295] and offer a free trial at the user's installation," Page said.

The program itself requires 3K plus whatever room for buffers the user can spare. It works any IBM OS or OS/VS environment, he added.

The company can be reached through P.O. Box 6372, Anaheim, Calif. 92806.

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IUP Extends IBM Life Insurance Program

WHITE PLAINS, N.Y. – The Statutory/Generally Accepted Accounting Procedures (GAAP) Valuation System, an Installed User Program (IUP) from IBM, supports life insurance applications running under IBM's DOS/VS and based on the Consolidated Functions Ordinary (CFO II) program product, a spokesman noted.

Developed by actuaries at Carlin-Black Systems Corp. in Louisville, Ky., the system calculates statutory and GAAP reserves, premium items, details on policy values, reserves released and policy exhibits for year-end and interim reviews, he added.

The valuation portion of the package covers life insurance, annuities, accident and health, supplemental benefits, "extra life" and "paid-up" categories. It accepts the CFO II policy master file directly, IBM said.

The programs extract records from the CFO policy master file, perform various sorts, develop control totals, perform the valuation calculations, print reports and create output files for later programs, the spokesman said.

The logic includes edits, "meaningful" error messages and audit trail reports with control totals, he added.

Written in ANS Cobol, the system was tested with the Cobol/VS compiler and the Sort/VS under DOS/VS Release 32. The programs require three magnetic tape drives, a 3330 disk unit, a printer and a card reader; modifications can be made to eliminate the need for the tape drives or to support other disk systems, IBM said.

The largest program, not including sort, is approximately 90K bytes.

As an IUP, the system will be provided with error-correction services only until Oct. 31. Within that time frame, the support is limited to providing a list of errors and proposed solutions.

The system costs $1,040/mo but payment is waived after the first 12 months of continuous use, IBM said.

CAC 'Texed' Creates Documentation

CINCINNATI – Texed from Computer Assurance Corp. (CAC) is described as a program that produces "publishable" documentation, letters and standard operating procedures from free-form punched-card input.

In addition to printing whatever text is provided according to user-provided format instructions, the program also provides a table of contents and an alphabetic index with page number references for longer pieces of documentation, the company said.

Input cards are free-form except for three columns on each which are set aside for printer format control. All extraneous spaces are suppressed so that, for example, sentences can be punched on individual cards and sequenced as desired just before the actual print run, CAC said.

Written in ANS Cobol, Texed runs in a 20K partition under IBM's DOS or DOS/VS and requires only a card reader and a line printer as peripherals.

Source code for the program is available for $350. Buyers are also provided a test deck – which produces a user manual – and a hard-copy user manual, a spokesman said from Department C-D, CAC, 8041 Hosbrook Road, Cincinnati, Ohio 45236.

Symposium on Operating Systems Seeks Papers for 1977 Conference

WEST LAFAYETTE, Ind. – The Sixth Symposium on Operating Systems Principles (SOSP-6) will be held a year from now, on Nov. 16-18, 1977, at Purdue University here.

Papers emphasizing concepts or principles of general application in operating systems are invited, according to SOSP-6's paper coordinator, Dorothy E. Denning.

The meeting is sponsored by the Association for Computing Machinery (ACM) Special Interest Group on Operating Systems. It will be hosted by the Computer Sciences Department and arranged by the Division of Conferences and Continuing Education at Purdue.

In the call for papers, Denning said March 31 is the deadline for six copies of each article to be considered. All should be typed (double-spaced) and none should be more than 20 pages long.

The papers will be reviewed "blind" by the program committee, so the author's name and affiliation should appear on the cover page only, she added.

Notices of acceptance or rejection will be sent out by May 15; papers of special merit will be included in a special issue of the *Communications of the ACM* in early 1978.

Papers for the conference should be sent to Denning, SOSP-6 Paper Coordinator, Computer Sciences Department, Purdue University, W. Lafayette, Ind. 47907.

Directory from Atsu Details T/S Services

BOULDER, Colo. – The Association of Time-Sharing Users (Atsu) has published the first three sections of a comprehensive directory for users of commercial time-sharing and remote computing.

Called the "Interactive Computing Directories," they complement the association's bimonthly newsletter, "Interactive Computing," according to Hillel Segal, president of Atsu.

Section Coverage

The first section covers financial modeling languages offered by the time-sharing companies, with data covering 60 languages.

The second section covers interactive data base systems while the third, called "Company Profiles and Security Precautions," offers information about 40 companies offering remote computing services.

The cost of membership in Atsu, including the newsletters and directories, is $60. Atsu is at 75 Manhattan Drive, Boulder, Colo. 80303.

Service Aids Investments

TORONTO – A service to help money managers see how a portfolio will perform under various conditions is available from Canavest House Ltd.

The user must provide the raw data based on what he thinks is likely to happen to such variables as interest rates, wage settlements and commodities prices, Canavest said.

Once the user determines the likely return, holdings can be changed appropriately, a spokesman explained.

By-products of the service are hard-copy reports the user can show his clients to explain why certain investments were made.

Users need only English to access the service's two IBM 360/75s by dial-up phone lines.

The service costs $13,000 to $30,000 annually. Canavest can be reached through P.O. Box 13, Commerce Court Postal Station, Toronto, Canada M5L 1A3.

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Survey Finds Users Favor Unrestricted DP for Carriers

By John P. Hebert
Of the CW Staff

RAMSEY, N.J. – Telecommunications users favor minimum regulatory restrictions on the use of computers as an integral part of terminal services provided by common carriers, a recent survey has found.

The Center for Communications Management, Inc. (CCMI), an independent telecommunications research organization here, conducted a survey providing readers of its industry publication, *This Month in Telecommunications,* a chance to voice their opinions on "the role of the DP functions within the data terminals service offerings of the communications common carriers."

Tired of Overregulation

A CCMI spokesman said ballots indicated users are tired of overregulation of the DP and data communications functions in all areas and types of business and believe the dividing line between the functions should be decided by open competition.

Preliminary results of the survey showed 56% of the 200 telecommunications users, consultants, vendors and carriers surveyed selected definitions offered by CCMI which would not restrict the carriers' use of computers at the terminal level, CCMI reported.

The results were summarized and distributed to all Federal Communications Commission (FCC) commissioners, the Office of the President and members of congressional committees active in telecommunications legislation, CCMI said.

Copies of the findings sent to the FCC were entered into the record of the second Computer Inquiry as users' views on current definitions of the boundary between data communications and DP, the CCMI spokesman noted.

Second Inquiry

A second inquiry was initiated, the FCC said, because distributed networks in which CPUs and terminals are performing both DP and communications control applications have been among the developments since the first inquiry in 1971 [CW, Aug. 9].

Readers of the CCMI publication were asked to choose one of six alternative definitions of the role of DP as it applies to carriers' terminal offerings. CCMI ranked the six definitions as restrictive to the common carriers' use of computers, permissive or noncommittal, the spokesman explained.

No attempt was made to categorize a seventh choice, which offered the respondent his own opinion, although some of those responses were sent to the FCC along with the survey's results, he added.

A total of 37% of respondents agreed there should be no restrictions placed upon the carriers' authority to provide integrated DP functions with their data terminal equipment; about 21% said if a user's primary application of a terminal's DP capabilities is limited to word processing of the communications functions, it should not be classified as a DP system.

User Majority

CCMI noted 62% of respondents were users, 10% were consultants, 10% were common carriers and 7% were equipment suppliers.

Respondents were also asked to categorize the size of their firm or organization using gross sales as a yardstick; 45% of the returned questionnaires were from firms with sales over $100 million and 19% were from respondents in organizations with annual sales between $10 million and $100 million.

About 20% of all those who returned the survey favored a permissive stance for common carriers' use of computers at the terminal level, CCMI said.

The responses were "probably the opinions of more outspoken people because it was not easy to get the responses back" to CCMI; the publication's readers had to take the initiative to return the questionnaires, the spokesman said.

CCMI can be reached through P.O. Box 324, Ramsey, N.J. 07446.

Fujitsu Net Architecture Based on HDLC

By Ronald A. Frank
Of the CW Staff

CHICAGO – Fujitsu Ltd. has developed a data communications architecture which is operational on several Japanese data networks utilizing the firm's Facom CPUs, according to Shigeo Shiratori of the Fujitsu data communications architecture staff.

Called the New Network Architecture (NNA), or Realized Network Architecture, the technique includes a data link protocol based on the Higher Level Data Link Control (HDLC) developed by European standards groups, Shiratori told a session on international data networks at the recent Info '76 conference here.

An advanced network architecture had to be developed for Japanese data users because of the high cost of carrier facilities; a voice-grade line costs about $3,000/mo over a 500-mile link for operation at 2,400- or 4,800 bit/sec, Shiratori said.

NNA is based on a separation of on-line system functions into DP and data communications control. It also includes a classification of data communications control functions and the use of HDLC, he explained.

HDLC is more reliable than conventional basic mode link control procedures because it has sequential number and check bytes against error in each transmission block and corresponding response, Shiratori said. Although the Fujitsu architecture is similar to IBM's Systems Network Architecture (SNA), it was developed before SNA and is different in implementation, he added.

In designing the architecture, the separation of DP and data on-line system functions also helped clarify the respective roles of control programs and applications programs. As a result, the role of control programs was redefined and the support level was improved, he said.

Three hierarchical levels were incorporated into the architecture, according to Shiratori. These are data link control, network control and path control levels.

In addition, a protocol was developed for remote job entry and file transfer called the application control level, he noted.

The link level controls a data link between physically connected nodes to prevent errors occurring on communications lines. Various types of nodes exist: center systems, subcenter systems, terminals, etc.

The network level controls a session between a source node and a destination node to transfer data correctly. The path level controls a session between a process in one end node and a process in another to connect and disconnect them. The path level also controls data flow between the nodes, Shiratori explained.

Path-level control may be done when net-level control is in operation and net-level control may be done when link-level control is operating. In each station, three control modules correspond to the control levels, but each level of protocol is independent of the other, enhancing flexibility since one can be changed without affecting the others, Shiratori said.

One network operating with the Fujitsu architecture includes a Facom 230 Model 58 which "has nearly equal perform-

(Continued on Page 21)

'Dicam' Lets Datasystem 350 Communicate With IBM 360/370

MAYNARD, Mass. – Digital Equipment Corp. has introduced software which allows the company's Datasystem 350 series of small business systems to interactively communicate with IBM 360/370 mainframes.

Written in Digital's Business-Oriented Language (Dibol), the Dicam software permits 9,600 bit/sec transmission in IBM's Bisynchronous protocol over dial-up or other phone lines, according to a DEC spokesman.

This allows a decentralized approach to DP operations, he added.

Dicam permits the local storage resources of a Datasystem to complement the data base and processing resources of the host IBM system while remaining an independent processor, he said.

Datasystems operating with Dicam include CRT terminals, printers and mass storage devices ranging from 512K bytes on floppy disks to 112M bytes on removable disk cartridges, he said.

Major application areas for the distributed processing arrangement include sales order entry, inventory control, billing, consumer information and relations, payroll and waybill generation, according to the firm.

The Dicam software, which runs under DEC's CTS-300 operating system, has a licensing fee starting at $4,500; it will be available in January, the spokesman noted from DEC's Commercial Products Group in Maynard, Mass. 01754.

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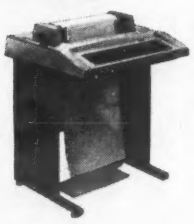

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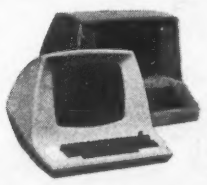

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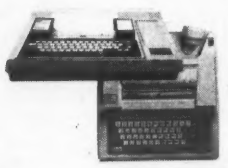

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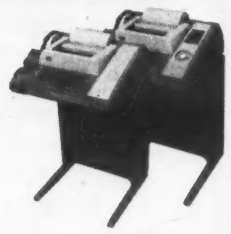

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Upgrades Controller, Adds Scanner

IBM Brings Out 3660 Enhancements

WHITE PLAINS, N.Y. – IBM has upgraded the controller portions of both its 3660 supermarket key-entry and scanning point-of-sale (POS) systems while adding another, smaller scanner to the 3660 scanning system.

IBM's 3663 Model 3 terminal control segments – logic and memory boxes which work in conjunction with the key-entry supermarket terminals – can support three checkout keystations; its Model 2 predecessor had the capability to support only two stations, an IBM spokesman explained.

With the 3663 Model 3, the maximum number of checkout lanes for the system is increased from 12 to 18, which also translates into savings in some medium-sized installations, he said.

For example, supermarkets installing the key-entry system with the upgraded controller segment for nine checkout lanes can purchase a typical system for about $47,600 compared with about $59,500 for the same configuration with a 3663 Model 2. The spokesman said the cost saving results from a greater sharing of computational capabilities.

The Model 3 control segment performs the same functions a key-entry system in-store controller performs if the system controller fails, he added.

Certain in-terminal devices such as keypad locks are now optional features, although two previously extra-charge optional keyboards are now available as no-charge options, IBM said.

First shipments of the 3663 Model 3 control segment are scheduled for this quarter.

Model 2 Controller

The corporation also brought out the 3661 Model 2 in-store controller for the 3660 key-entry system. The Model 2 features up to 560K characters of information storage, double the storage capacity of the Model 1 controller, IBM said.

The 3661 Model 2 stores data for price lookup, in-store reports and sales for the entire system. It will be available in the third quarter of 1977 and carry a purchase price of $14,620.

Along with the key-entry system introductions, IBM also announced another version of its supermarket POS system scanner.

The IBM 3667 scanner is contained in a 28-in.-high enclosure; the previous Model 3666 scanner is 38 in. high.

With the 3667, a store with 10 checkout lanes can purchase a basic system, including an in-store controller, terminals, scanners and adapters, for about $133,100 compared with the previous cost of $154,100. IBM noted the savings primarily result from the lower cost of the 3667 and from lower cost adapters.

Additionally, IBM reduced the purchase price of its current 3666 scanning unit from $4,240 to $3,560, which is the price of the 3667 scanner, according to the spokesman. The reduction was possible because of cost savings in IBM's engineering and manufacturing of the scanners, he said.

Label Preparation Device

Another feature introduced for the 3660 systems is a shelf-label preparation device enabling supermarkets to print price labels in the store.

With this device, pricing and merchandise information can be developed by a supermarket chain's headquarters and transmitted to an in-store control unit. There, IBM said, labels can be printed two at a time, side by side on a supermarket system POS terminal.

The label preparation feature for both systems is field-installable and will be available in April at a cost of $600 or on IBM's Alternate Term Plan for $23/mo.

Converter Debuts

WORCESTER, Mass. – What is billed as the only 8-bit digital-to-analog converter in a dual in-line package that includes a storage register has been announced by Micro Networks Corp. (MN).

The MN3020 converter can be used directly with microcomputer or minicomputer data buses because of its input registers, according to an MN spokesman.

The unit includes an internal reference and output amplifier as well as the storage register; the input circuitry is said to be TTL-compatible.

When the converter-enable input is high, input data is held and the analog output will not change with further changes in the digital input.

The MN3020 is priced at $39. A military version, the MN3020H, costs $69 from MN at 324 Clark St., Worcester, Mass. 01606.

Fujitsu Using HDLC As Architecture Base

(Continued from Page 20)

ance to the IBM 370/158," Shiratori said. The Model 58 serves at the center node and communicates with subcenter nodes that have a Facom 230 Model 35 and a Model 28.

Transmission between these centers at 48 kbit/sec utilizes NNA. Data entry and inquiry into the network are done on Facom 9520 CRT terminals and Facom 1520 teleprinters, he said.

The network simultaneously handles message collection, distribution and remote batch applications with the high-speed lines sharing the traffic.

Another distributed network for a manufacturer uses HDLC on all its links and utilizes several minicomputers as intelligent terminals, a node CPU and a process computer, Shiratori said.

HDLC More Effective

A study of network implementations using NNA showed the HDLC-based operation was 1.1 to 1.3 times more effective than basic mode on point-to-point applications, he said.

Full-duplex transmission is common on these types of configurations, so this transmission mode was assumed for the comparison, he pointed out.

In a multipoint evaluation comparing half-duplex basic mode with full-duplex HDLC mode, NNA was 2.1 to 2.3 times more efficient, he said.

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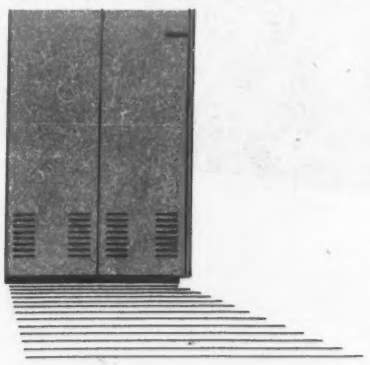

Qantex Adds Interface Adapter

PLAINVIEW, N.Y. – Qantex has a dual interface adapter, the DIA-100, designed for use with its models 2200, 2400 and 2710 cartridge storage systems.

The DIA-100 permits a storage system to become a two-port device; one of the systems' two ports can be interfaced to similar or different controllers, Qantex said.

Utilization of the DIA-100 is said to allow two or more redundant CPUs to share a common data base by communicating with the Qantex cartridge storage peripheral.

CPUs accommodated by the system include the Digital Equipment Corp. PDP-11, Intel Corp. 8080 and Rolm computers.

The adapter consists of a single printed circuit card that plugs directly into the storage system.

The DIA-100 costs $695 from Qantex at 200 Terminal Drive, Plainview, N.Y. 11803.

CMC 1800 Gets Remote Keystations

MARINA DEL REY, Calif. – The CMC Division of Pertec Computer Corp. has added remote keystation capability for the CMC 1800 Keyprocessing System.

The video display keystation is offered in two models, the CMC 1155 and 1156, each with detachable keyboards, according to a Pertec spokesman.

The 1155 features a keypunch-style keyboard while the 1156 has a typewriter-style keyboard with numeric pad, he said, adding both models utilize standard CMC software.

The remote data entry capability reportedly allows keystation operators at remote sites to enter, verify, correct and update data through dial-up phone lines under the control of a central supervisor.

A built-in remote keystation adapter/modem at the remote site and a remote keystation controller at the central site enable the 1800 system to control the remote keystations, the spokesman said.

Data transmission to and from the keystations is asynchronous and full-duplex on two- or four-wire systems, he noted.

Each remote keying terminal can interface a second keystation terminal – for a total of two – directly to the communications line by means of a Bell-supplied Data Access Arrangement (DAA), he added.

The CRT units for both models can display eight 32-character lines and a 240-character data record plus 16 characters of mode and status information.

The keystations operate at two speeds: at 150 bit/sec to the CPU and at 2,400 bit/sec from the CPU to the keystation to update or change data appearing on the CRT.

A 480-character buffer comes with either model as standard equipment, although only 256 characters are ordinarily used, a spokeswoman added.

Both keystations cost $8,400 each or $4,900 each in groups of eight; they lease for $210/mo or $122.50/mo respectively, she added.

The CMC Division of Pertec is located at 2500 Walnut Ave., Marina del Rey, Calif. 90291.

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Trivex Launches Fault Isolation For Plus 70 CRT

ORANGE, Calif. – Fault isolation routines which reportedly spot the cause of display system failures have been added to Trivex, Inc. Plus 70 IBM 3270-compatible systems at no additional cost.

With the isolation routines, according to Trivex, the terminal controller lets the user determine whether the terminal system, communications controller, modem or phone line is the cause of malfunction.

The user can trace the source of the problem to the host computer, at the far end, or down to the board level of the terminal, a spokesman added.

Microprocessors that drive the Plus 70 are used for the diagnostic routines; pressing a test button on the device activates the isolation program, Trivex said.

The terminal controller's diagnostic program also monitors the quality of the communications portion of the system and stores the information in terms of non-acknowledgements (NAK) sent and received from the time the system was last powered, it added.

Information in the controller can be released in status report form to any of the Plus 70's display and print stations or transmitted to the user's central site, the company said from 2201 N. Glassell St., Orange, Calif. 92665.

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With Users, Within Data Center

Doctrine of Separation Suggested for DP Departments

By Nancy French
Of the CW Staff

CHICAGO – Good organizational controls are important in all areas of a business, but they are particularly important in DP because they ensure the quality of the DP product as well as the financial stability of the company, according to William Murray, a senior marketing support administrator for IBM's Data Security Support Program.

Since application development controls all other operations in the DP department, DP should be formally separated from the using departments, Murray told a recent Info '76 session here.

All requests for development of new programs or changes to old ones should be authorized, tested and accepted by using departments, he said.

User departments should be accountable for ensuring the work done by the DP department is consistent with their authorization and their expectations. Source documents should be created and maintained by user departments, he added.

Separation of Duties

Not only should the DP function be separated from users, duties within DP must also be maintained separately, Murray suggested.

A person who has responsibility for job initiation should not have responsibility for data input or data output, nor should a person whose job it is to add vendors' names to a file be responsible for authorizing payments.

At best, that employee could make costly errors that go undiscovered. At worst, he could even convert certain applications to his own uses, Murray said.

It was recently discovered that a New York City programmer made a five-line change in a program which contained a one-line error. That error caused $21 million in welfare checks to be sent to dead people, Murray said.

It didn't make city officials feel much better to learn all but $7 million of those checks were recovered, he added.

In converting to new systems, DPers often recombine duties and forget why the original responsibility separations were made, he pointed out. For example, several years ago IBM replaced a batch accounts receivable system with an on-line real-time accounts receivable system.

In the batch system, the accounts receivable master record has its own customer name and address fields; people who were authorized to process accounts receivable transactions could not change those customer name and address fields.

In the real-time system, the accounts receivable record had no name and address field but merely pointed to the customer master record.

In one branch office, an accounts receivable specialist was authorized to process the return of typewriters for credit and the clearing of those credits by issuing a check. As part of an unrelated duty, he was authorized to make changes in the customer master record.

One day the employee processed the return of a typewriter for an attorney. That afternoon he opened a post office box in the attorney's name and pointed the customer master record for the attorney to the post office box he had just opened; he then caused the credit to be cleared by the issuance of a check.

After removing the check from the post office box, he changed the name and address field of the customer master record back to the attorney's place of business.

In order to cash the check, he opened a bank account in the attorney's name using the check as both identification and as an initial deposit, Murray said.

He was detected when the statement that went to the attorney showed his credit had been cleared by a check. Since the attorney had received no check, he called to inquire, and the manager was alerted.

The individual was dismissed, but not prosecuted. However, the manager, too, was dismissed for poor management, Murray said.

Honesty Not Enough

Too many employers – especially the Defense Department and banks – believe all they need do is hire honest people. Instead, they should take the responsibility for keeping their employees honest by giving them thorough supervision, Murray said.

If an employee is terminated, he should be terminated at once. One insurance company that terminated a tape librarian with two weeks' notice nearly went under because in those two weeks the individual was able to destroy the entire system of backup tapes, he said.

Operational controls provide for integrity of data and should be used to help detect and correct errors as well as ensure all data is processed, he said.

Key verification, in which source data is key entered twice, is one method, and in on-line systems conversational feedback is another.

Amdahl 470V/6 'Very Close' To Meeting Objectives: Input

By Esther Surden
Of the CW Staff

MENLO PARK, Calif. – Although Amdahl Corp.'s original objective of obtaining two times the performance of the IBM 370/168 has not been achieved, on a price/performance basis the Amdahl 470V/6 is "very close to meeting its objective" of providing twice the power for the user's money, according to a report by Input, a market research organization here.

"Generally on a price/performance basis, Amdahl does even better than the results presented on a straight performance basis," according to the report, "Assessment of Amdahl as a Viable Alternative to IBM."

"One customer cited a 1.51 performance figure on benchmarks, but quoted a 1.9 to 1 advantage over the 168 on price/performance," Input noted.

The report was based on interviews with 10 companies which are Amdahl equipment users and nine that considered the Amdahl system but rejected it. An independent benchmark run by a consultant affiliated with Input was also used as a basis of comparison.

Performance and Price Increase

The IBM 168-3 provided a 5% to 13% performance improvement over the 168-1, but also contained an increase in price which kept price/performance relatively stable, the report said.

"The attached processor system has a theoretical performance approaching Amdahl, but the increase in price still leaves the price/performance advantage with Amdahl," it added.

Five users who currently have Amdahl 470s reported the results of eight benchmarks which showed performance of the system in the range of 1.1 to 2.3 times the 370/168.

Seven of the users who rejected the systems reported 1.3 to 2.0 times the performance of the 168 in their benchmarks, the report indicated. The consultant's benchmark also backed up the results of the user benchmarks, the report stated.

The overall results "are somewhat on the high side compared with those reported in our interviews, but that is probably due to the nature of applications selected which used a substantial amount of decimal arithmetic," Input noted.

On an instruction-by-instruction basis, 18 instructions are slower on the Amdahl than on the 168. "The most significant one is Execute where the 168 is more than two times as fast as the Amdahl," the report said.

Amdahl, however, has released an engineering change which increases the performance of this instruction, it noted.

"However, most Amdahl instructions are between 1.5 and 2.5 times faster than the 168," the report concluded.

The full report costs $2,500 from Input at Suite 320, 2180 Sand Hill Road, Menlo Park, Calif. 94025.

Univac Disk Storage Subsystem Added for 1100 Systems, 90/80

NEW YORK – In conjunction with its recent announcement here of the 1100/80 large-scale system [CW, Nov. 15], Univac introduced the 8434 disk storage subsystem, which can be used with both the 1100 systems and the 90/80.

The 8434 increases the on-line storage for the 90/80 to 4.9 billion bytes and for the 1100 systems to 1.7 billion words in fixed record formats, Univac said.

The subsystem for the 1100 series includes a 5046 controller and two to 16 disk drives. For the 90/80 system, the subsystem includes a 5040 control unit and two to eight drives.

The controllers can accommodate either 8434, 8430 or 8433 drives in any combination as well as an 8405 fixed-head disk as an option, the firm said.

Each 8434 drive includes a fixed disk stack of 10 platters with 19 recording surfaces; the last surface is used for servo positioning information. Each drive can store up to 307M bytes in software-supported formats, the company noted.

A voice coil electromagnetic actuator positions the read/write heads in about 30msec; throughput is said to be 1.25M byte/sec.

The word-oriented disk control unit offers diagnostic capability via a microprogram loaded from a diskette. The byte-oriented 5040 is also microprogrammable, Univac said.

The 8434 disk subsystem in a minimum configuration with two disk drives costs $4,876/mo on a one-year rental plan or $168,600 to purchase. It will be available in April.

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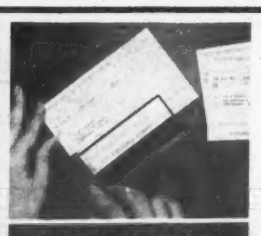
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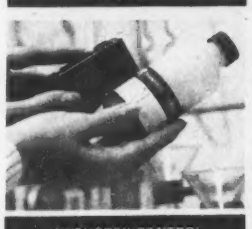
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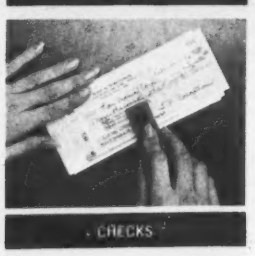
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Multi-CPU Sites Get CPI Monitor

WATERLOO, Ont. – The DSP-190 is a minicomputer-controlled hardware monitor designed for large-scale system users or the multiple CPU shop, according to its vendor, Computer Performance Instrumentation, Inc. (CPI).

Available in three models, the monitor can concurrently produce a 128-function system profile, two working set maps at 3M sample/sec, eight additional maps at .1 MHz and tracing of system accesses to up to 700 IBM 3330-type disk drives, the firm claimed.

The unit can also control five remotely located monitors and process management reports, a spokesman added.

The three models are determined by the components involved, he noted. A Model 1 has 192 sensors, eight concentrators, four collectors, a Digital Equipment Corp. PDP-11/34 minicomputer with 64K of memory, two floppy disks, 80M bytes of 3330-type disk, a 1,600 bit/in. tape unit, graphic CRT input console with eight-color display, front-end processors and a 180 char./sec printer. It runs under DEC's RSX11-M operating system.

The Model 2 has eight collectors and the Model 3 has 384 sensors, 16 concentrators, 96K of memory, an attached measurement processor and uses a PDP-11/04 as well as the 11/34.

Hybrid Mode

In addition to performing as a conventional monitor with self-contained collection, reduction and reporting resources, the DSP-190 can operate in full Hybrid mode, CPI noted. It may be fully programmed for a particular measurement from a process originating in the host CPUs, the spokesman explained.

Software support includes a standard package of 40 management-oriented reports and a measurement syntax language which allows users to create their own applications and reports.

The Model 1 costs $164,175, the Model 2 is priced at $180,175 and the Model 3 costs $229,870. First deliveries will be in January, CPI said from 572 Weber St. N., Waterloo, Ont., Canada N2L 5C6.

Stand-Alone Printer Available From LRC

RIVERTON, Wyo. – A 40-column stand-alone printer system is available from LRC, Inc.

The Model 140 uses a dot matrix impact printing method and is controlled by a proprietary MOS interface chip which includes a 48-character buffer, a character generator and control logic, LRC said.

Character width and density can be changed at any time – even during printing – through external commands, according to the firm.

Options include RS-232C or current loop communications interfaces, pin-feed platen, high-speed paper feed, label printing and front-feed document printing.

The unit costs $495 from the firm at Technical Research Park, Riverton, Wyo. 82501.

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Dual Processors Hold Surprises

By Don Leavitt
Of the CW Staff

SAN DIEGO – The Bonneville (Ore.) Power Authority studied the changes in its DP environment as a result of shifting to a multiprocessor system and the results held some surprises, according to an analyst for Control Data Corp. who worked on the project.

The upgrade took place in September 1974 and involved moving from a CDC 6400 to a 6500, which is the same system with a second 6400 CPU, Michael A. Gray told the Computer Performance Evaluation Users Group (CPEUG) here recently.

The addition of two more disk units in late October 1974 "had a considerably smaller impact" than the second CPU did and, since the work load remained approximately equal, the performance changes were quite directly attributable to the second CPU.

Within a year of the change, data collected by the system log and by a software monitor written in-house showed a 25% increase in batch throughput.

Other statistics showed the system was I/O-bound for batch work and, as previous studies had indicated, this was enough to limit the throughput increase, he explained.

A "considerable increase" in log-ons and time-sharing CPU hours showed the second CPU had a major impact in this area. The logic of the Scope 3.3 operating system allowed a split of the batch and time-sharing jobs and the second CPU enabled each stream to use one CPU.

Throughput for time-sharing, therefore, increased sharply, he said.

An "interesting effect" of the high utilization of one CPU being split between the two CPUs was that there was only a slight increase in CPU hours divided by wall clock hours with the addition of the second CPU, Gray continued. In effect, the single CPU "appears to have degenerated" into two lower utilization CPUs.

The percentage of one CPU's work for batch had decreased while the time-sharing percentage nearly doubled, he said, noting the slack in the batch utilization was taken up "almost completely" by the second CPU.

Main storage is "very highly" utilized, but decreasing the main storage use – which "could lead to considerable improvement" – depends strongly on peripheral processing unit (PPU) activity, Gray said.

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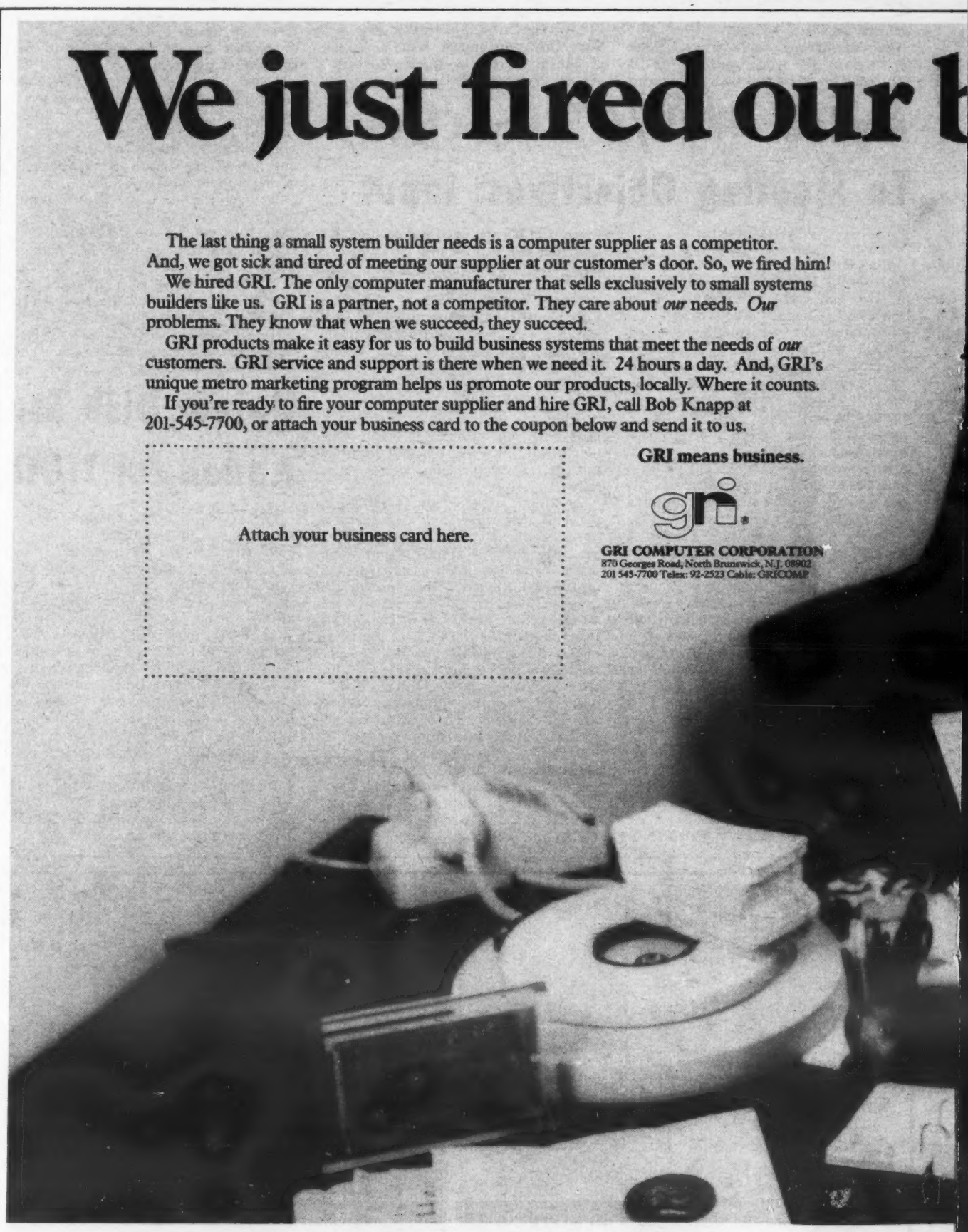


Baking Firm Whips Up Savings With Data Entry System

By Alan W. Hawkins
Special to Computerworld

COLLEGEDALE, Tenn. – The conversion from IBM keystations to a Univac 1900 Computer-Assisted Data Entry (Cade) system at the McKee Baking Co. here has increased keystrokes by about 2,000 per hour while allowing the firm to catch about 75% of the key errors through verification.

McKee is a privately owned snack cake baker which makes Little Debbie Snak Cakes, distributed to over 42 states.

The decision to upgrade from the two IBM 3742 keystations and the one 3741 with a 3747 tape converter used to convert the data to tape for input into the company's Univac 9480 mainframe was reached for a variety of reasons.

The IBM systems offered limited editing capabilities and the DP department wanted to do value ranges and table lookups.

Also, data had to be input into the system in a very structured way and the firm wanted the operators to be able to enter the data as it appeared on the input document.

Reluctant to Relinquish

The key operators were very reluctant to give up the 3740s because they were fast and easy to use. However, the firm needed to be able to provide additional editing at data entry time.

At first, McKee decided to try a distributed network system from Datapoint Corp. The system didn't work because the firm's software did not provide the response time required for the batch data entry applications run at the baking company.

The company felt it didn't need the extra added capabilities of the distributed system and, after two months, the system was scuttled.

McKee then considered systems from Entrex and Keydata as well as the Univac Cade system, but found that neither the Entrex nor the Keydata system could keep up with the speed required by the firm.

The next step was to order and install a Univac 1900 Cade system with six keystations. At installation the systems cost $13,065/mo. A subsequent upgrade of 8K of memory, bringing the system to 57K bytes, and the addition of eight keystations has increased the monthly cost to $21,091.

The company is pleased with the way the conversion turned out. It took about two weeks to write the programs (approximately 10) for all the applications already running on the 3740s, plus a few additional ones.

Now, about 55 programs are on the Cade system.

The largest application is the billing, during which 7,000 document/day are processed.

Check reconciliation, a garage repair system for the firm's trucks, a trip record system for the salespeople, accounts payable and several master update applications are also run on the system.

The average keystroke rate is now about 18,000- to 20,000 keystroke/hour and two operators key over 24,000 keystroke/hour with less than .05% verifiable error rate.

The edits in the system down the line indicate that the system is catching about 75% of key errors through verification.

The average keystroke rate on the IBM systems was between 16,000- and 18,000 keystroke/hour.

Happy With Operation

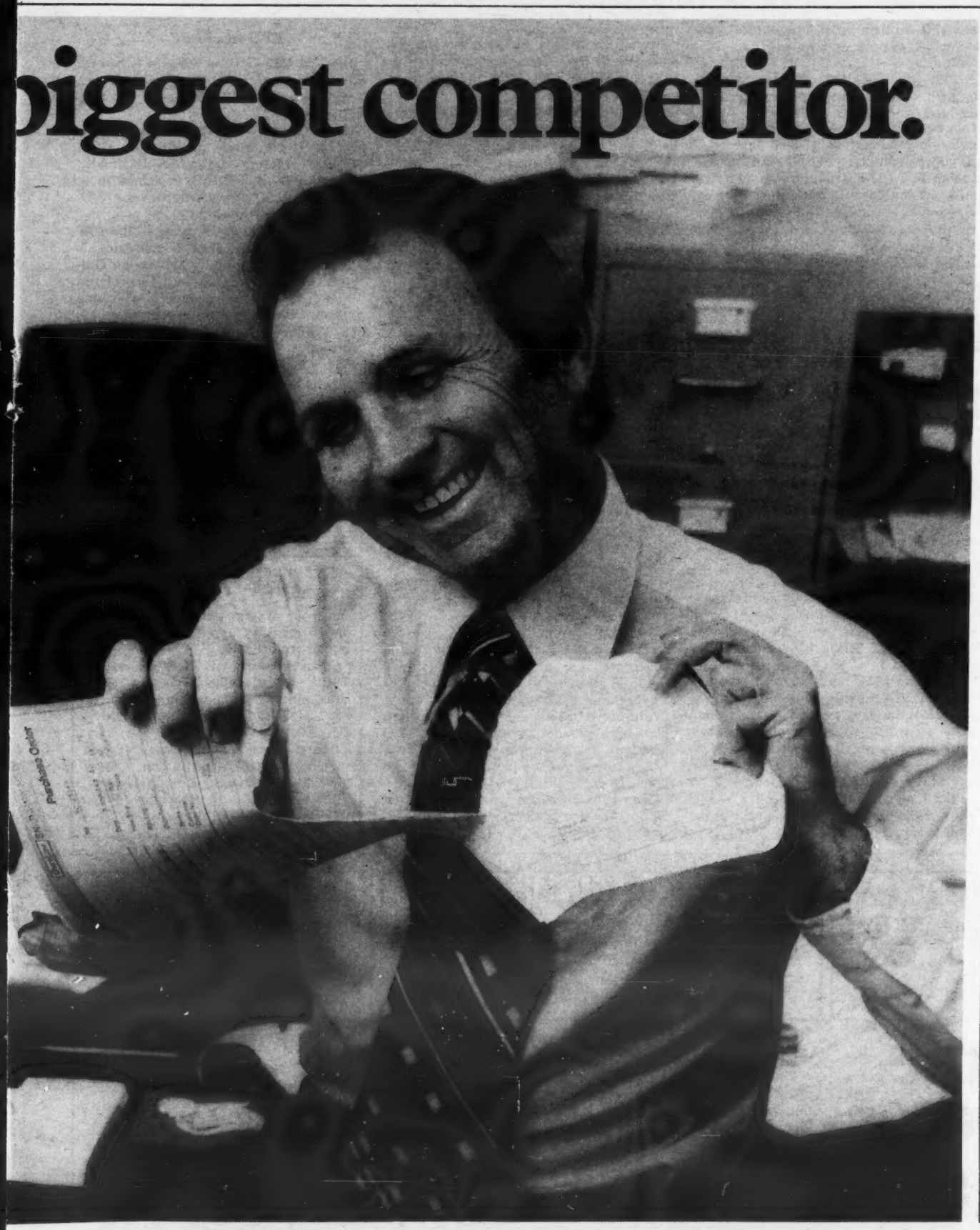
The key operators are happy with the way the terminal operates.

Increases in volume have less impact on workload because of the faster keying rates and the cleaner data that goes to the computer room. Some applications required three or four punched cards per transaction and the firm can now key these items in one pass.

In most applications, there is less data to key because keying of duplicate fields has been eliminated.

Another advantage is that the company can key data as it appears on the source document and reformat it internally for output.

Hawkins is DP manager at McKee Baking Co.



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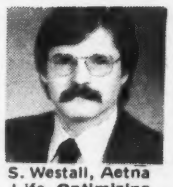

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Bits & Pieces

Fabri-Tek Add-On Memory Designed for DEC PDP-11

MINNEAPOLIS – The Add-In 11 from Fabri-Tek, Inc. is an OEM semiconductor add-on memory system for the Digital Equipment Corp. PDP-11 series.

The Add-In 11, which uses dynamic MOS technology, is plug-compatible with the PDP-11/04, 11/05, 11/34, 11/35, 11/40, 11/45, 11/50 and 11/55, the company noted.

The system is offered in a 16K by 18-bit or 16K by 16-bit configuration contained on a printed circuit board that plugs into the PDP-11.

Memory capacity can be increased in 16K increments up to 128K words and memory operation can be interleaved on 4K boundaries, the firm said.

The 16K by 18-bit version with on-board regulator for the 11/05 through 11/55 costs $1,250; the 16K by 16-bit version for the 11/04 to the 11/34 costs $1,185, the firm added.

Fabri-Tek is at 5901 County Road 18, Minneapolis, Minn. 55436.

Med-E-Comp Adds Mini for Doctors

HURST, Texas – A turnkey minicomputer for use in doctors' offices and based on an Interdata, Inc. 6/16 CPU has been introduced by Med-E-Comp Corp.

Physicians can display their own forms on the CRTs, the firm said.

Medical records, billing, accounts payable, taxes, payroll and insurance packages are available for the system.

A basic system includes a 6/16 CPU with 65K of core memory; 5M bytes of disk expandable to 200M bytes; a CRT; matrix printer; and a backup cassette tape storage system, the firm said.

The system costs under $16,000, it added.

Med-E-Comp Corp. is at Dept. C-6, 632 Bedford Euless Road, Hurst, Texas 76053.

Tion Announces Burster

OAKLAND, Calif. – A burster designed for use with small-business systems is available from Tion Co.

The 260B has a tear bar that measures forms length, aids forms feeding and is "virtually jam proof," the firm claimed.

The bar is combined with a transparent safety cover which can only be raised by lifting the paper width guides and closed by pulling the safety release knob, the firm said.

Operating at either 82 ft/min or 125 ft/min, the unit can handle single-part continuous forms.

Tion is at 262 Grand Ave., Oakland, Calif. 94610.

Family of Three Machines

Varian V77 Aimed at Multi-CPU Nets

By Esther Surden
Of the CW Staff

IRVINE, Calif. – A family of minicomputers ranging in size from an OEM CPU on a board to an end-user supermini has been introduced by Varian Data Machines here.

The three upwardly compatible microprogrammed CPUs announced recently were designed to allow users to structure "multiprocessor networks of tightly coupled computers," the firm said.

They are suited for use in aerospace, financial, governmental, scientific or university environments, a spokesman added.

The family was developed to give the user three ways to build multiprocessor systems – through shared memory, through intercomputer I/O bus connections and through serial communications channels, the spokesman noted.

Called the V77-200, V77-400 and V77-600, the CPUs are software-compatible with current Varian minicomputers, he added.

Common features throughout the V77 family include use of a dual data bus, microprogramming, 32-bit arithmetic capability, a 187-instruction set and byte, word and double-word addressing.

Hardware multiply/divide, 64-vectored interrupts, direct memory access (DMA), a real-time clock, automatic program loading and the capacity to accommodate CRT or teletypewriter controllers are additional common features, the spokesman said.

For communications and networking applications, a data communications multiplexer and its associated line adapters provide a universal communications hardware interface for the V77 family, the company noted.

Megamap Option

The 600, the top-of-the-line V77 model, is on the level of a Data General Corp. (DG) Eclipse or a Digital Equipment Corp. PDP-11/70, the firm claimed. It features a 370 nsec, 1K-word cache memory with a 90% hit rate, the spokesman said.

Using the Varian Megamap memory mapping option, the 600 can accommodate up to 1M words of 660 nsec MOS main memory, Varian said.

Up to 4K words of writable control store (WCS) can be accommodated by the 600, he added, noting the microinstruction is 64 bits wide.

A floating-point processor which performs single- and double-precision as well as floating-point arithmetic is available for the 600. Floating-point processor transfers are made through DMA, the firm noted.

The 600 also has all of the characteristics of the smaller 400, which is said to perform at the level of the DG Nova 3/12 or the more powerful range of DEC PDP-11/34s, the spokesman said.

The 400 features power fail-restart, memory protect, and dual-port memory capacity for shared-memory applications. It can accommodate up to 256K words of main memory without memory mapping and up to 1M words with the Megamap option. Byte parity is available for main memory, according to the spokesman.

The WCS feature on the 400 allows users to generate their own microinstructions with a standard microprogram software package. The WCS for the 400 has storage locations for a maximum of 3K 32-bit microinstructions, he noted.

The dual-port shared memory introduced allows the CPU to directly access memories of other V77 systems.

High-speed peripherals can be linked directly to the memory bus, which transfers data at 1M word/min, he added.

CPU on a Board

The V77-200 CPU on a board is said to offer performance in the range of a DG Nova 3/4 or a DEC 11/34 on the low end of the line.

The 200 can accommodate a maximum of 32K 16-bit words of 660 nsec MOS memory. Memory is expandable in 8K, 16K or 32K increments packaged in a chassis with a power supply and I/O controllers, the firm said.

Users of the 200 can upgrade to the 400 by substituting processors, Varian said.

The systems run under the Varian Omnitask Real-Time Executive (Vortex) and Vortex II mulitprogramming operating systems. Communications take place via the Vortex Telecommunications Access Method.

The V77-200 costs $1,200 for the processor board only or $7,600 for a chassis-mounted CPU with 32K of memory and V77 family standard features. The 400 costs $10,100 with 32K words of memory.

The 600 with 64K, 16-bit words of memory costs $22,450.

All systems will be available in the first quarter. Varian is at 2722 Michelson Drive, Irvine, Calif. 92713.

Reality II From Microdata Designed for Small Businesses

CHICAGO – Microdata Corp. introduced a small business system at the low end of its Reality product line and a line printer at Info '76 here recently.

The Reality II is a limited-expansion system aimed at businesses smaller than those which have traditionally used Reality products, the company said. The basic configuration includes the 1600 CPU, 16K bytes of main core memory, 5M bytes of virtual disk memory, 5M bytes of file store memory, a Prism display terminal and a Scribe 120 char./sec matrix printer.

The system is expandable to a maximum of 32K bytes of core memory and can accommodate two additional terminals, according to a Microdata spokesman. A user can also select remote slave matrix printers for use with a Prism on any of three I/O ports, he added.

Priced at $31,000, the Reality II will allow users to upgrade through the entire reality line, the vendor said.

The Scribe line printer is manufactured by Applied Computing Technology, acquired by Microdata last week as a wholly-owned subsidiary.

The printer, which has optional interactive graphics capabilities, utilizes a 4-bit microcomputer controller for its 9 by 7 dot matrix and prints an Ascii 96-character line. It has a 320-character internal buffer for storing over two full lines of data, the spokesman noted.

Optional features include 165 char./sec speed, horizontal and vertical addressable head positions, half- or full-duplex operation and a keyboard for the operation of a byte-parallel system console.

Additional interactive graphics options include a parallel or serial RS-232 I/O interface, a keyboard for terminal operation, full incremental plotting and foreign language capabilities, the firm said.

The 120 char./sec printer priced at $2,910, is also available in OEM quantities for $1,950 each.

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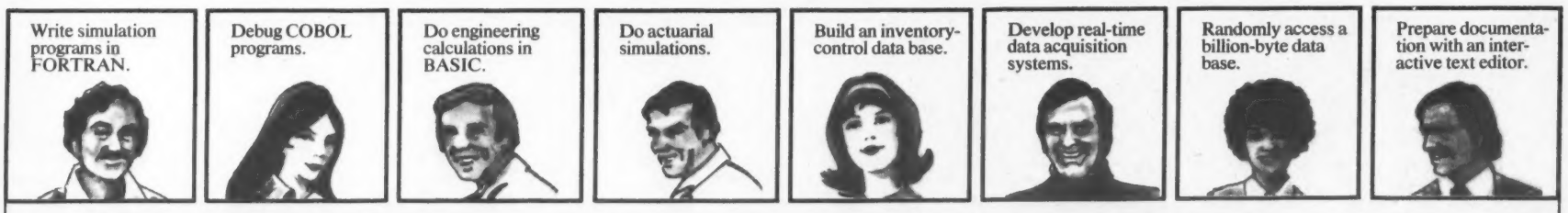
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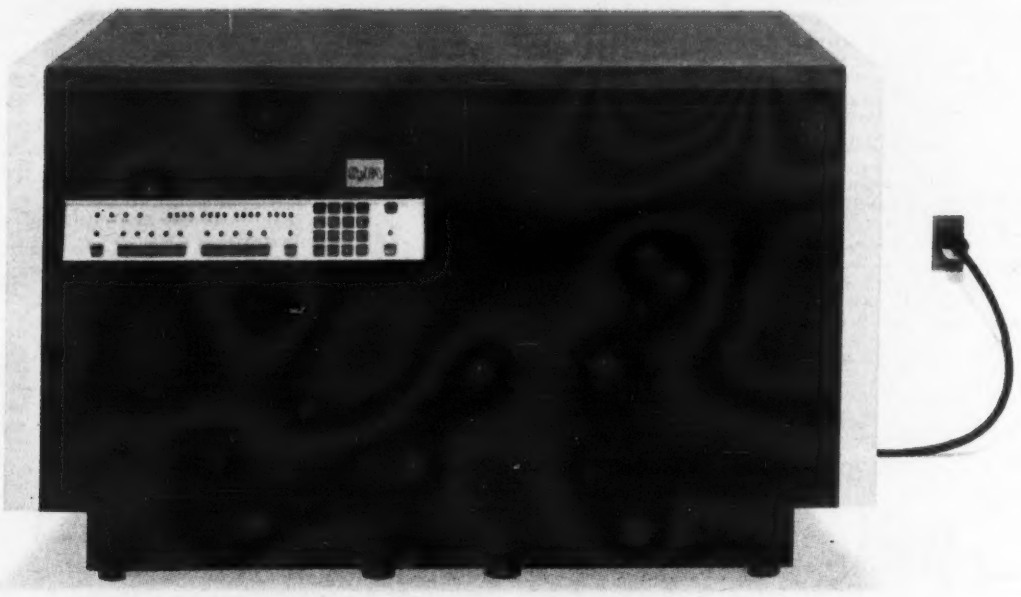

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It All Started With T/S

Growth Forces Small Firm to Switch to Larger Mini

MINEOLA, N.Y. – Expansion caused by unprecedented growth is a problem facing many small firms as they develop. For Van Wyck International Corp. here, expansion meant taking out the limited-capacity small business system it had been using since 1972 and putting in a larger minicomputer.

"Our strength has been service," according to Irwin Septimus, executive vice-president for the supplier of electrical kitchen appliances.

"To give service, you need information – the right information – quickly," he said, adding the small system was getting bogged down and not providing the necessary information.

The firm's DP history goes back about eight years, when it decided to do something about its ballooning paperwork problem. Time-sharing seemed to be the solution, but even a switch from one time-sharing company to another didn't provide the information Van Wyck needed.

Finally, the firm made the leap to an in-house system in 1972.

First Expansion

A Basic Four Corp. Model 400 system was installed in Mineola to handle order processing, billing, inventory control, accounts receivable and sales analysis. This workload began to grow very quickly, and the system expanded from 4.2M bytes of disk storage and two CRTs to 12.6M bytes of storage and four CRTs.

But even this large increase was insufficient, Septimus said. During peak season, open order files had to be maintained on three separate removable disk packs. A monthly sort of sales performance required about 60 hours.

As sales continued to rise – from $14 million in fiscal 1975 to $24 million in the most recent period – the volume of paper increased and information too frequently was lagging.

"Two areas in particular had to be upgraded," according to Donn Liles, president of Data Basics Corp., Van Wyck's consultant and software supplier.

"First, management was always frustrated by inadequate information on the status of open orders, obviously a critical factor when you depend heavily on customer service as a prime weapon in your battle against competition. Second, the system was very slow in sorting; it was difficult to get meaningful after-the-fact data on sales, shipments, etc. in sufficient time to react."

Second System

So the decision was made to move on to another in-house system based on the recommendation of its accounting firm and, in January of this year, work began to convert to the Micos minicomputer with Data Basics providing programming. The Micos system, from Mini-Computer Systems, Inc., offered more total capacity, Liles explained.

The system, installed in April, includes a CPU with 64K bytes of core, two 80M-byte disk drives, four CRTs and a 600 line/min printer.

Though costs, including those for applications software, are about the same as for the Basic Four system, the Micos system offers about 12 times the on-line disk storage, three times the print speed and, for certain applications, faster internal processing speeds, he said.

A number of new reports and processes were instituted immediately, including shipments by state, sales by salesperson and customer and open order inquiry.

In the near future, other items will be added, including a magnetic tape interface with Van Wyck's factoring concern; payroll; in-process inventory and bill of material control; raw material inventory control; material requirements planning; purchasing; accounts payable and magnetic tape interface for automatic microfilming of transactions and reports.

One of the virtues of Micos, Liles said, is that it can be expanded at low cost.

Meanwhile, Van Wyck is pleased with the advances already made. The monthly sales analysis that used to take 60 hours is now available in 20 minutes, Septimus noted.

Nova/Eclipse Subsystem Allows Mix of Cartridge, Floppy Disks

SOUTHBORO, Mass. – Data General Corp. (DG) has introduced a cartridge disk subsystem which it said allows mixed cartridge disk and floppy disk configurations and can be dual-ported for shared configurations.

The subsystem was designed for use with the firm's Nova and Eclipse minicomputers.

The subsystem can contain 10M-, 20M-, 30M- or 40M bytes of storage. Up to four disks or floppies can be mixed on a controller. A switch allows users to manually select drives, the firm added.

The dual-porting feature is said to allow the configuration of dual-processor shared disk systems using standard equipment and software. It is optionally available and can be added at the user's site, DG said.

The system is supported by all DG real-time operating systems, a spokesman added.

A single-drive subsystem including a cartridge disk drive, integrated power supply, controller and cabling costs $9,950. A 20M-byte subsystem costs $17,950, the firm said.

The subsystems are available immediately from DG in Southboro, Mass. 01772.

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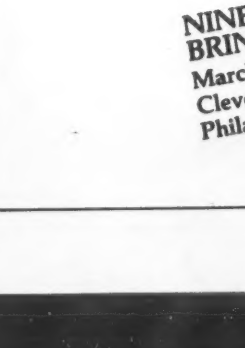

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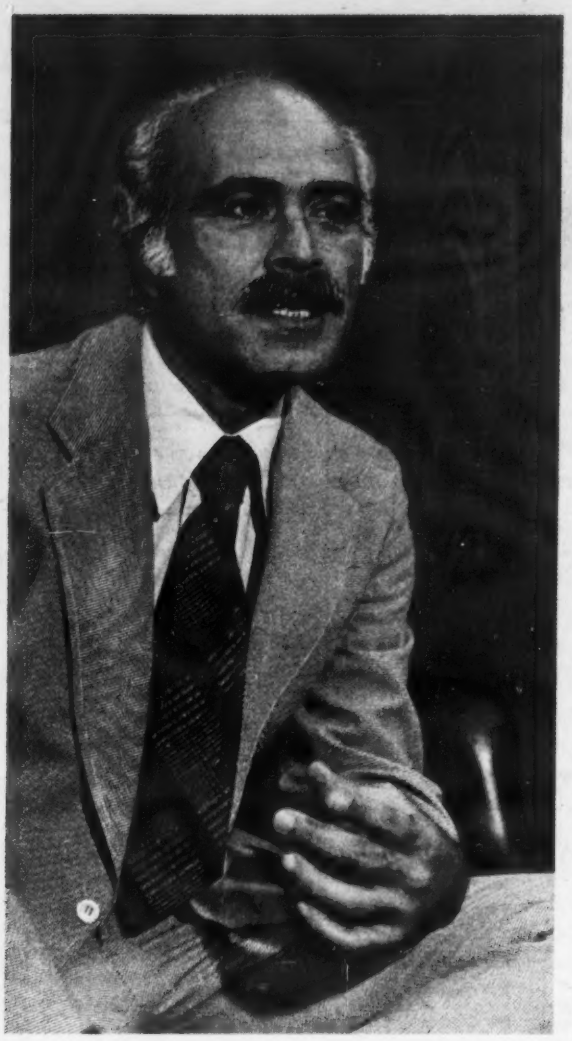

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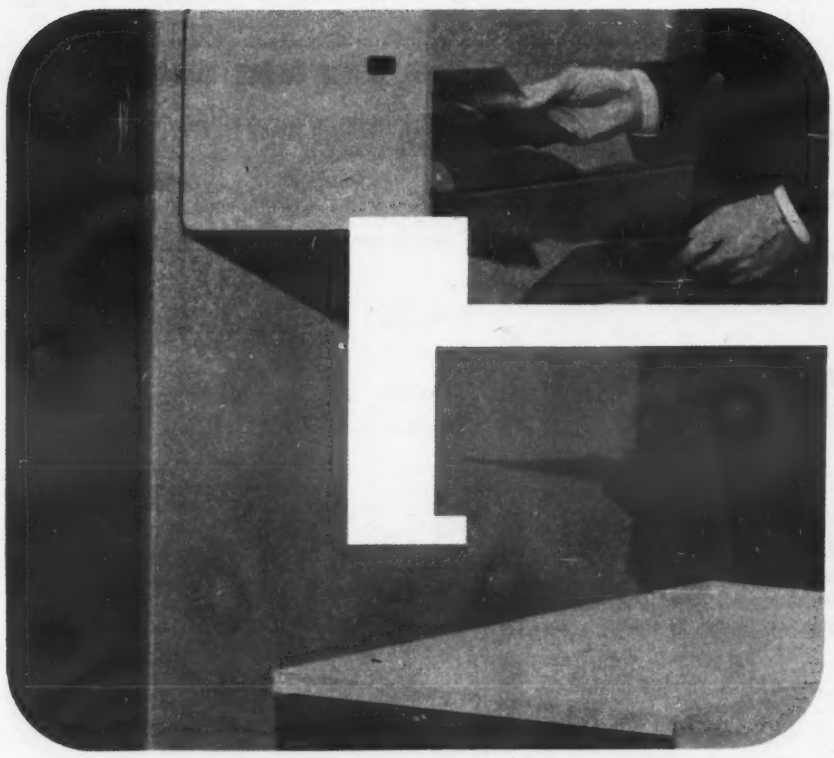

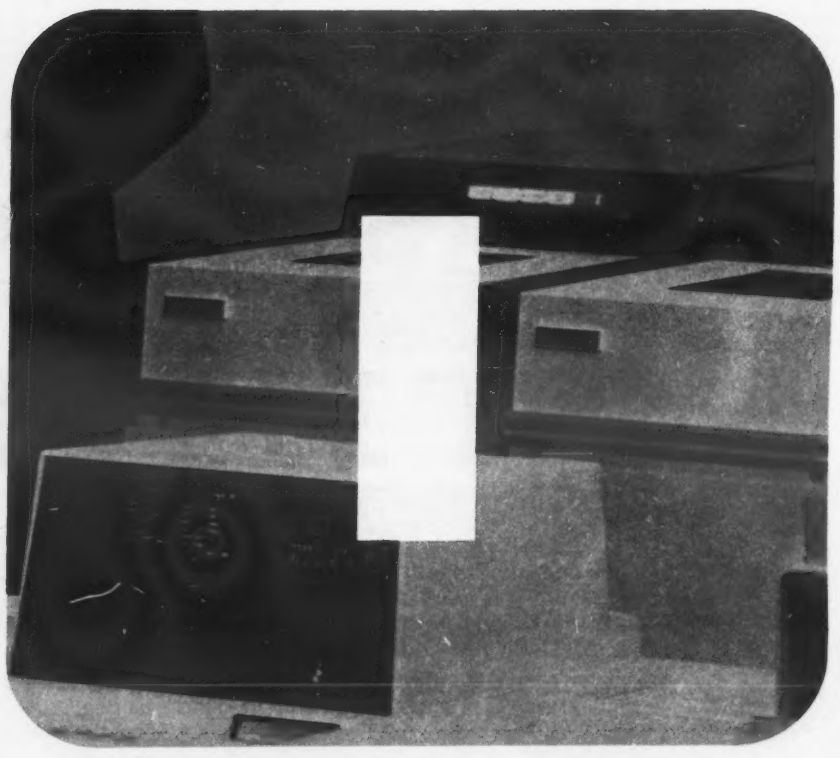

CI Notes

Milgo Shuns Adds Merger

MIAMI – Milgo Electronic Corp. has rejected a merger proposal from Applied Digital Data Systems, Inc. (Adds).

Milgo's board of directors, which voted unanimously to reject the proposal, told Milgo "the merger proposal is not in the best interest of the shareholders and did not reflect the long-term prospects" of Milgo, according to a Milgo spokesman.

Under the merger proposal, Adds contemplated taking over Milgo, offering 1.5 shares of its common stock for each share of Milgo. The transaction would have been valued at around $50 million.

William J. Catacosinos, Adds president, said the transaction was proposed as a merger designed to be a tax-free reorganization.

Adds had sales of $17.8 million in its last fiscal year and reported a 53% increase in earnings and a 40% rise in sales for the nine months ended Aug. 31. Milgo reported sales of $40.4 million in 1975, but earnings dropped 56% and sales 3.4% in the nine months ended June 30.

Memorex, Quantor Pact Set

SANTA CLARA, Calif. – Memorex has entered into an agreement with Quantor Corp. for the sale of Memorex 1603 computer output microfilm (COM) printers and 1620 film duplicators to Quantor.

The equipment will be marketed under Quantor's name as part of its total COM system product line; Memorex will provide maintenance for units installed in the U.S.

Quantor chose the Memorex products because they plug directly into IBM 360/370 systems, according to Charles Askanas, Quantor president.

Supershorts

GTE Sylvania, Inc. is providing digital technology training to 150 civilian engineers and technicians employed by the U.S. Navy.

– – –

Data General Corp. delivered its 1,000th Eclipse computer to Societe Generale at the bank's London office.

– – –

Computer Automation, Inc. has appointed Dycor Data Systems Ltd. as exclusive distributor for the Syfa system in Canada.

During 1971-75 Period

Study Shows Four Makers Grew 38%

By Molly Upton
Of the CW Staff

NEW YORK – Four mainframers experienced a 38% average rate of growth in the installed base of their large configurations during 1971-1975, according to a report from L.F. Rothschild & Co., an investment and brokerage house here.

The large configuration market, made up of those systems valued at $2.9 million to $3.5 million, comprised about 23% of the total 1975 installed base of four vendors: IBM, Burroughs, Univac and Honeywell Information Systems (HIS), the report indicated.

IBM and Univac each attained 41% of their growth in this area during the five years, followed by HIS with 29% and Burroughs with 22%, according to Rothschild.

Using data supplied by International Data Corp., Rothschild divided the systems market into seven classifications of systems sizes and among the four mainframers.

Spread Only 9%

There was only a 9% spread among the four in the size of their bases devoted to large configurations, the report showed. IBM, the leader, had 25% of its base in large configurations while Burroughs, which held the smallest portion, had 16% at the end of 1975.

The division of market share in this area remained relatively static between 1971 and 1975, with IBM going from 79.8% to 78.4% while Burroughs started at 3.4% and edged to 3.9%.

Univac managed to grow from 7.5% to 8.7% while HIS dipped from 9.3% to 9%, according to the report.

In the very large configuration sector, which experienced the next highest growth rate of 22% during the five years, IBM and Univac pretty well carved up the market between them.

For systems valued at $4.6 million to $9.6 million, IBM held 71.5% of the market in 1975, up from 65.4% in 1971, while Univac slipped to 25.6% from 34.3%. Very large configurations represented 11% of the four makers' installed base at the end of 1975.

The only area with a negative growth rate during the five-year period was the medium-small category, composed of systems costing $130,000 to $370,000.

As a percentage of total growth during

(Continued on Page 31)

CLASS	1	2	3	4	5	6	7
IBM	2% / 1%	23% / 10%	(6%) / 9%	(1%) / 28%	18% / 17%	41% / 25%	23% / 10%
Burroughs		12% / 5%	1% / 18%	33% / 38%	26% / 21%	22% / 16%	6% / 2%
Univac*		(7%) / 7%	(2%) / 9%	23% / 15%	(5%) / 10%	41% / 23%	50% / 30%
HIS		12% / 8%	(8%) / 20%	18% / 32%	45% / 19%	29% / 20%	4% / 1%
TOTAL	2% / 1%	18% / 9%	(5%) / 11%	5% / 28%	20% / 17%	38% / 23%	22% / 11%

L. F. Rothschild & Co.

Key A/B

For each vendor:
A = Class as a % of total growth 1971-1975.
B = Class as a % of installed base 1975 year-end.
* - 6% of Univac Installed Base = Misc. Categories.

Chart pinpoints four mainframers' rates of growth in seven configuration sizes. It also shows what percentage of a vendor's base is in each category.

Vendors Not Quite Harmonizing On Common Definition of DDP

By Toni Wiseman
Of the CW Staff

CHICAGO – The definitions of distributed data processing (DDP) at the recent Info '76 here were as numerous and varied as the vendors.

While all agreed DDP depends on a communicating network of hardware, the consensus stopped there, with each vendor varying the scenario slightly dependent on his products' special capabilities.

John R. Bonne, director of data systems marketing at General Automation, Inc. (GA), said DDP "is merely the distribution of an intelligent processing capability to different geographic or functional locales, with each of these distribution points being large or small in terms of processing power and each with a potential for growth or expansion as the application demands."

A DDP network as he envisions it can be comprised either solely of minicomputers or of minis communicating with a host computer. GA, he noted, sells systems for both configurations.

The company is primarily selling sys-

(Continued on Page 32)

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Consumer's Market

BEDFORD, Mass. – The tape market "is a real Ralph Nader market; the consumer is getting more for his money," according to Sig Tolman, planning manager at BASF Systems.

The margins in the tape business have been diminishing, John Healion, director of marketing, said in explaining the projected price hike by BASF at the end of this year [CW, Oct. 25].

The prices of raw materials for items such as polyester film have increased as much as 20%, he said, and further price hikes are expected.

The tape market has become increasingly price-competitive, giving no relief from the pressure applied by price hikes in raw materials, he remarked.

The overseas market reflects the same competitive situation, he added.

Energy Crunch

Tape prices were lowest at the end of 1973, Healion said, and then the energy crunch and its concomitant raw material price hikes raised them somewhat at the end of 1974.

Although current prices are now as low as in 1973, "they're not far from it," he said, although raw material prices are higher.

Healion estimated the tape market is growing about 5% to 6% per year and also shifting to smaller systems.

The firm's flexible disk line is doing well, he said. BASF supplies primarily IBM-compatible diskettes but will make them to an OEM's specifications, he said.

BASF Sees Trend to 'Winchester' Disks

By Molly Upton
Of the CW Staff

BEDFORD, Mass. – The OEM market for Winchester-type units looks "very, very good and is growing rapidly," according to John Healion, director of marketing at BASF Systems.

Helping to compensate for the trend among users of large IBM systems toward fixed disks is the increased demand by users of minis and midis for removable disks, such as 11-high platters, Healion said.

Predictions Erred

As a result, BASF's predictions that sales of its 11-high packs would decline rapidly as of the end of 1975 didn't materialize. Minis and Midis from such firms as Hewlett-Packard Co. and Digital Equipment Corp. are incorporating versions of 11-high drives, he said.

Rather than falling dramatically, the 11-high market is somewhat flat, he added.

In response to the higher than projected demand, BASF started refurbishing and selling packs that came in off lease, according to Sig Tolman, planning manager.

Another reason for the 11-high's popularity, he added, is that the East European market peaks at different times than the U.S. and thus offers additional market opportunities.

Sales Force Expansion

BASF is planning to expand its sales force in order to handle the increasing number of prospects represented by the smaller systems market such as the IBM 3/12, 3/15 and smaller 370s, Healion said.

In addition, the firm is seeking to place more technical expertise in the field to keep up with the increasing complexity of products, such as Winchester-type devices.

BASF, the first independent to ship a Winchester-type module, is supplying these to various OEMs, he said.

Gearing Up Took Time

Gearing up to making a Winchester-type unit took some time, Healion recalled. Previously, magnetic particles on a disk were arranged randomly, but in a Winchester-type unit the particles are aligned in the direction in which the recording is done. Also, the coating is extremely thin.

But production is flowing very well, he said, adding he expects the techniques learned from making Winchester-type units will be incorporated into other types of disks.

BASF's revenues are pretty evenly split between flexible and hard media, Healion said. In addition to disks, the plant makes floppy disks and computer and audio tape in reels and cassettes.

Four Makers' Bases Average 38% Growth

(Continued from Page 30)

the five years, this category declined 5% and comprised only 11% of the installed base at the end of 1975, according to Rothschild.

Medium Market

The medium configurations – those with price tags ranging from $480,000 to $960,000 – had an average growth of 5% for the four makers during 1971-1975; IBM experienced a 1% decline in this category when viewed as part of its overall growth pattern.

But while IBM declined, Burroughs experienced 33% of its growth in this sector and had 38% of its installed base in the medium sector.

IBM's market share declined from 80.9% in 1971 to 75.3% in 1975, while each of the other three mainframers increased their shares in the medium configuration category. At the end of 1975, HIS had 12.6%, Univac 4% and Burroughs 8.1%, Rothschild indicated.

HIS experienced 45% of its growth in the medium-large sector, comprised of machines costing $1.2 million to $1.8 million, the report said. HIS had 19% of its total installed base in this area in the end of 1975, Rothschild said.

In terms of market share, IBM dropped from 80.1% to 74% and Univac declined from 9.9% to 6.7%. HIS grew from 4.1% to 12% while Burroughs rose from 5.8% to 7.3%, the report showed.

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Vendors Differ on Distributed Processing Definition

(Continued from Page 30)

tems that are stand-alone minicomputer networks, not front-ending to a host, he said, but there are certain large computers that may tie into the net.

In the future, the network itself will become the processing medium and what was formerly the host will just become another node in the network, Bonne predicted.

Networks will replace host computers and front-end types of systems along with the evolution away from centralized data bases, he said, noting the Bank of America is distributing a data base of 25 billion characters into over 30 different systems.

"With minis and micros now supporting large file systems, there is less and less of a reason for having one centralized data base," Bonne believes.

The evolution at GA is toward large communication networks that are very modular, he said. The modules, which may have one, two or up to six minicomputers, will handle redundancy, recovery and nonstop operation as GA begins to provide software enabling the modules of multiple minis to work together as a single processing entity.

Power Near Transaction

Ed Gistaro, vice president of marketing for Datapoint Corp., said DDP is "the concept of putting computer power closer, if not at, the actual site of business transactions."

DDP "came about with the availability of low-cost, easy-to-use computers that were operator-oriented, not Buck Rodgersish," he added.

The main function of the mainframe in Gistaro's concept of DDP is data base maintenance, which provides a central focal point, while distributed points maintain regional or departmental data bases as well.

"We're not talking about usurping mainframes, but rather about making data more usable by cleaning it up before it gets to the mainframe," as well as putting data back into the hands of the people who need and are interested in it, he said.

Eyeing the future, Gistaro said vendors must keep in mind that users have spent so much time and money getting their act centralized they cannot decentralize overnight.

Donn Ulmer, president of Century 21 Data Systems, a Microdata Corp. distributor, thinks the entire concept of DDP evolved because users could not control information from a central standpoint and were not getting the response time they needed.

Microdata's approach to DDP is to provide a stand-alone system with communications capabilities because of the power inherent in the system, he said. The firm is not dealing with "General Motors" companies, but with unique entities for which communications on a batch basis is sufficient, he noted.

Microdata's system will allow on-line operations, he added, but the firm is selling more batch systems because of the lower cost.

Minis will be accessing a central data base to a certain extent, but to a much greater extent each installation will maintain its own information, in Ulmer's schema.

"The concept is young enough now that it will take a couple of pioneers to get it truly off the ground," he said, noting that for "political" reasons "number crunchers" will stay around for a while because DP centers will have to justify their in-house IBM 370s and because they want to maintain overall control.

But, he added, this will be harder and harder to do as more minis capable of handling 5M-byte data bases come along.

More Than Terminals

Computer Automation, Inc. believes DDP entails placing "substantial computing power" in terms of input medium at the point of action as opposed to just data entry with an intelligent terminal, according to Carsten Brydum, communications marketing coordinator.

While data capture and data entry are sufficient to justify a DDP system, remote divisions now want to do more with the massive capability a full-powered mini can give them, he said.

Jim Mezger, marketing manager for Data General Corp., said his was the classical minimaker's view. "That means we are selling effectively to organizations that have large centralized systems, but can't seem to get the computing power that is there to work for them."

Remote Users the Key

Noel O. Kile, vice-president of marketing for Qantel Corp., defined DDP as "allowing remote locations to handle their own processing and submit summary information to headquarters on a periodic basis."

Remote users with minis rather than just terminals can have today's information today and headquarters can have the summary information it needs without excessive paper load, he said.

For Cummins-Allison Corp., DDP means "the processing of information in the most efficient and economical manner by the people or departments who need access to that information," according to William J. Hautigan, sales promotion manager.

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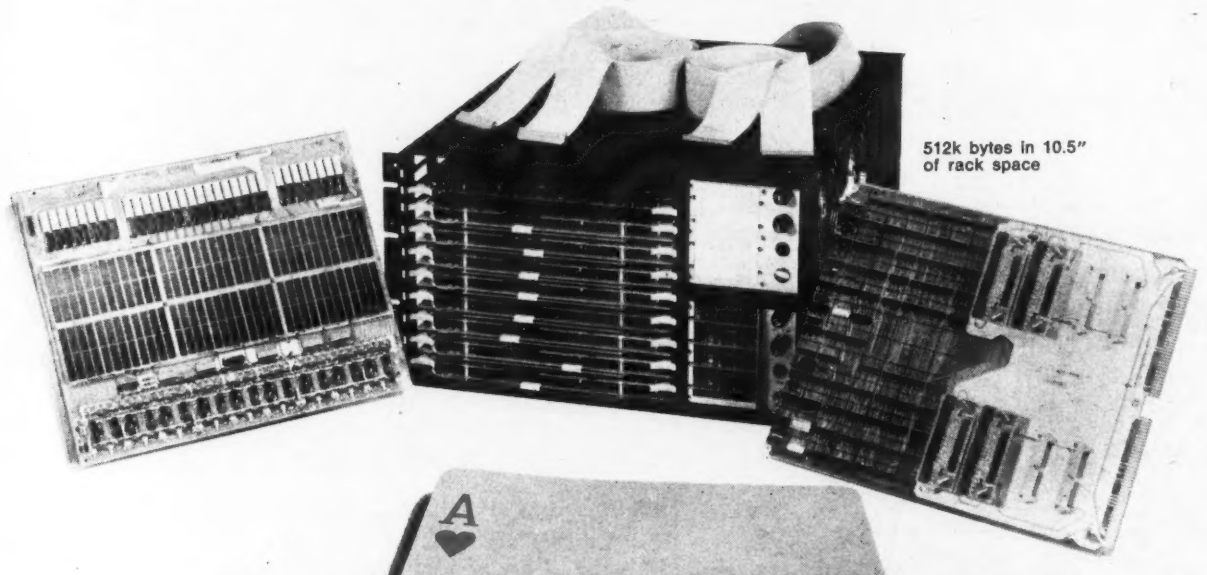

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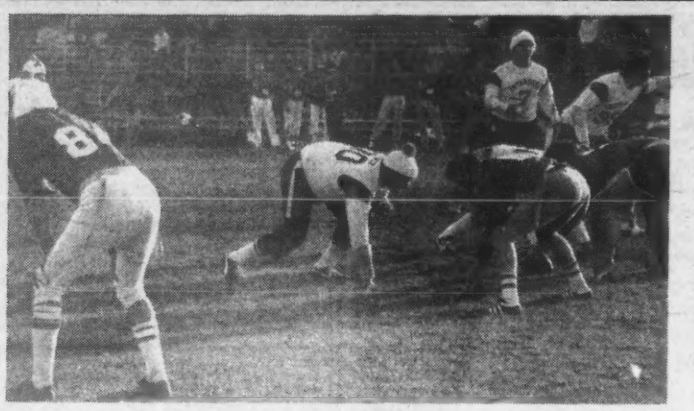

CW Photo by M. Upton

Pigskin Processing

WESTBOROUGH, Mass. – Data General Corp. (DG) took to the air to defeat rival Interdata in the third annual Databowl flag football game between the two firms recently.

DG was ahead from the start; the final score was 38-6. Interdata fought back in the second half and held DG to only one touchdown. Taking a page from DG's book, Interdata passed for a touchdown in the last half.

Interdata spectators, who bused up from New Jersey, outnumbered the tiny contingent from nearby DG. However, on the field, DG had at least two good passers and a galloping receiver with "great hands." The combination proved unbeatable. The Interdata team had not played before the game, although it had held some scrimmages.

Interdata Captain Dick Vivian acknowledged DG's prowess on the field and muttered, "Wait until next year."

With One-Stop Shopping

Shift Seen in Distribution of Terminals

BRIDGEPORT, Conn. – There is evidence the terminal industry is on the verge of a shift in distribution which can have enormous implications for the consumer, according to Joseph Sorrentino.

Small computer manufacturers and computing equipment users who want to purchase nationally known products and have them serviced under one contract are creating a new echelon in the distribution process, the president of Computer Peripheral Corp. (CPC) said.

This echelon is being served by one-stop terminal "supermarkets" that offer national distribution on a variety of brands and the ability to provide nearby service when equipment goes down, he explained.

CPC is such a company, offering three major lines of CRT terminals including those from Lear Siegler, Beehive and Hazeltine along with Okidata and MI^2 printers.

There is a growing number of companies like CPC "which are moving the manufacturer one echelon back in the distribution process so they are becoming the providers for the system, rather than functioning in their traditional role as its master," Sorrentino said.

"The need to know more about a business – and quickly – is creating increasing requirements for access to company computers at all levels, albeit with widely differing information needs.

"These applications variations are producing the expanding need in the marketplace for the multibrand showcase of terminals and equipment to meet the specific requirements of the application. This is where the supermarket-type terminal distributor is serving and thriving," Sorrentino said.

He believes his company's early success stems from being able to provide "the right terminal for the customer's application, when he wants it, and being able to be there with immediate service when a terminal has trouble.

"Substantial savings are achieved in negotiating only one service contract instead of a half dozen," Sorrentino said.

Evaluation Task

Sorrentino said it has been his experience that customers also like the way such distributors stay on top of developments in the terminal field and evaluate new products for their possible application.

"This," he explained, "is because terminal users are limited by the amount of time they can spend on keeping abreast of advancements. Companies like ours have to do it regularly – it's the way we stay in business – and the customer benefits through time saved and quicker introductions of innovations to their particular business needs."

Less than a year old, CPC has already expanded into 19 metropolitan markets.

"We're growing and moving rapidly because we feel we're blazing a trail with a few other companies. Soon there will be many more entering this field who will run close on our heels," Sorrentino said.

Executive Corner

■ Dause L. Bibby has been elected chairman of the board of directors of Decision Data Computer Corp.

■ Dr. William C. Leone, Thomas J. Klutznick and Harry G. Bowles have agreed to join the Datapoint Corp. board of directors.

■ Donald L. Eichler has been named to the board of directors of On-Line Business Systems, Inc.

■ Edward G. Uhl has been elected chairman of the board and chief executive officer and John F. Dealy has been elected president and chief operating officer of Fairchild Industries, Inc.

■ Jerome Drexler and Robert Hallock have been elected to the board of directors of Precision Monolithics, Inc.

■ Arthur R. Garofalo has been appointed president and general manager of MCS Infodevices, Inc.

■ D.K. Ritchie has become president of ESE Electronic Systems, Inc.

■ Darryl J. Dillenback has been promoted to vice-president of manufacturing for Magnetic Windings Co.

Seeing where you've been can show you where you're going.

Read the *Year-End Review and Forecast* in the combined December 27th/January 3rd issue of *Computerworld*.

As the once-in-a-lifetime U.S. Bicentennial approaches its demise, it's time to sit back and look beneath the headlines for the truly significant events of 1976. Beyond those tall ships, giant cakes and candidates, what really happened to shape and direct this historic year? If you're involved with computers, you'll find answers that affect you in *Computerworld's* Year-End Review and Forecast, appearing in the special, combined issue of December 27/January 3.

Edited by E. Drake Lundell, this special issue will be filled with useful analysis and insightful commentary on the year's most compelling computer stories. To name just a few items, this report will cover the latest developments in computer hardware, software and communications; the effect that recent (and pending) legal decisions and/or federal policy revisions may have on the industry as a whole; and the way computers are changing our society. In addition, a variety of experts will be on hand to help shake the dust from *Computerworld's* crystal ball, and give you knowledgable forecasts of important events that are likely to occur in 1977. It's all coming your way December 27th -- and if you're involved with computers, you'll find articles, newsnotes, commentary and summary that will interest and inform you.

And if you're marketing products or services to the people who use computers, your ad should be a part of this unique special issue. Contact your *Computerworld* salesman for complete details. Or call Judy Milford at (617) 965-5800 to place your ad, and start a beautiful 1977.

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SENIOR PROGRAMMER ANALYST

Major manufacturer of electrical control devices looking for a data processing professional who has a minimum of 4 years manufacturing experience. Candidates should have an understanding of manufacturing systems including B/M Processor, M.R.P., C.R.P., S.F.C., COBOL, T/P and P.I.C. user experience a plus. Send resume and salary history to Employee Relations Manager, 2901 Industrial Drive, P.O. Box 1158, Bowling Green, KY 42101, (502) 842-6511.

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1. Ability to establish and maintain effective relationships with employees;
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DESIRED QUALIFICATIONS include:

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RESUME to John K. Seitz, University of Kansas Computation Center, P.O. Drawer 2007, Lawrence, Kansas 66045, on or before December 1, 1976.

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GenRad

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F.L.M.I.
DATA PROCESSING CAREERS,
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Austin, Texas 78752
(512) 452-0971
Personnel Consultant

Senior Technical Specialist

This is your opportunity to get in on the ground floor of Digital's expanding LSI Development Program. In this wide-ranging position, you will provide technical support, mainly in the area of Software, to our LSI-11 sales specialists. Your responsibilities will include sales training, developing sales aids, delivering seminars, and giving application-oriented software consultation. Some travel will be necessary, as you'll be interfacing regularly with Engineering, Sales, and users.

You must have a good general knowledge of small systems software, and either Software Applications or real-time experience. A Bachelor's degree in Mathematics, Computer Science, or equivalent, is required. A knowledge of PDP-11 software, particularly RT-11 and RSX-11, plus FOCAL, BASIC, and/or FORTRAN are desirable.

Forward resume outlining salary requirements to Douglas J. D'Agata, Digital Equipment Corporation, 200 Forest St., Marlboro, Mass. 01752.

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Computer/Communications Software Professionals

HELP US BUILD THE WORLD'S LARGEST APL TIME SHARING SYSTEM

Scientific Time Sharing Corporation introduced interactive APL time sharing to the business community in 1969. We have been the pacesetter ever since, and our continued leadership is verified by an exceptional growth record. Now we're on the threshold of a bold *new* era of dynamic expansion.

We have purchased and installed an Amdahl 470 V/6 to meet growth requirements generated by new customers and exciting new applications of our APL*PLUS® Time Sharing Service. More big things are coming, and we need your help to make them happen. To carry out our plans to make APL* PLUS Service even more useful and powerful, we are seeking nine software professionals. More specifically, we're looking for:

- **Manager of Systems Software**
- **Manager of Communications Software**
- **Senior Systems Programmers**
- **Systems Programmers**
- **Communications Software Programmer**

Requirements range from 3 to 8 years of operating systems software experience (MVT/SVS/MVS) and communications software experience (IBM 3705, front end processors). APL systems and internals experience is highly desirable. Experience with time sharing systems and hardware performance measurement would also be very helpful.

You will be based at our headquarters in Bethesda, Maryland, a superior residential suburb of Washington, D.C. Our working environment is extremely creative. You will enjoy our kind of disciplined informality that breeds results and keeps stimulating you to greater achievement.

Let's talk. Local interviews can be arranged. Send your resume and salary requirements in confidence to: Jonathan D. Lazarus, Director of Systems Development.

Scientific Time Sharing Corporation

7316 Wisconsin Avenue, Bethesda, Md. 20014
An Affirmative Action, Equal Opportunity Employer M/F.

Programmer/ Analyst

Manufacturing Company located in Northwest Arkansas is looking for a programmer/analyst who would like to become involved with Manufacturing systems. (MRP, Shop Floor Control, etc.). Should have 1-1/2 to 2 years programming in RPG II. Send salary requirements and resume to:

Personnel Department
Shakespeare of Arkansas
P.O. Box C
Fayetteville, Arkansas 72701

Faculty Position: Department of Physics and Computer Science, Murray State University. Ph.D. in Electrical Engineering or related field required. Teaching and industrial experience desirable. The successful candidate will be expected to establish an undergraduate micro-processor and minicomputer laboratory. Rank and salary dependent on qualifications and experience. Send application including resume, three references, undergraduate and graduate transcripts to: Dr. Robert C. Etherton, Chairman, Department of Phy ics and Computer Science, Box 2109 University Station, Murray State University, Murray, KY 42071. Applications received after February 15, 1977, may not be considered. *EOE M/F*

MANAGER TECHNICAL DEVELOPMENT

Rapidly expanding international firm has an immediate opening for a person with 6-8 years experience in design and implementation of complex systems and an in-depth knowledge of systems design, operating systems technique and related hardware (370/158). SVS experience preferred, MVS experience helpful. Degree in a field related to information processing preferred. Salary 22-28K. Please send resume and salary history to:

CW Box 4828
797 Washington St.
Newton, Mass. 02160

Data Processing

Exceptional Opportunities In

SYSTEMS

We are a large 700 bed teaching hospital with an active and growing Computer Systems Division. This position has both immediate and long term expansion goals encompassing the immediate development of a new major system and a total system planning effort within administrative and medical areas.

The following opportunities offer excellent salaries and benefit packages along with the unique opportunity to innovate and grow with us. All replies will be held in confidence.

Director
Systems Development Section

Responsibilities include the overall management and development of this section along with planning new computer applications with various in-house divisions.

Requirements include a college degree, 6 years of experience encompassing the management of large, complex systems development projects and excellent written and oral communication skills.

SYSTEMS ANALYST

Your responsibilities in this important growth position include the defining, designing, and implementing new systems. In accomplishing these functions, you will report to and work closely with a senior systems analyst.

Requirements are 3 years of systems analyst and programming experience with a thorough knowledge of PDP-11 Computers, R.S.T.S. operating system and basic plus programming language. For this position a college degree and familiarity with health care systems is desirable.

PROGRAMMERS

You will be an important part of a professional team and work with systems analysts in developing and implementing new systems.

Requirements for this excellent growth opportunity include a minimum of one year of programming experience, minicomputer experience, some knowledge of PDP-11 Computers, R.S.T.S. operating systems and basic plus programming language.

Submit all resumes to Diane C. Lavine
Director of Employment

LUTHERAN GENERAL HOSPITAL

1775 Dempster St., Park Ridge, Ill. 60068
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We're offering outstanding Sales Engineers unique opportunities to sell advanced Level 6 minicomputers with big company support. We're looking for experienced minicomputer Sales Engineers, with a BS in Engineering or its equivalent, and 3-5 years selling to OEM's, System Builders and large end users. You'll become part of a dynamic sales organization and receive an excellent salary and benefits, commissions and the the chance to grow rapidly.

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The Level 6 minicomputer family brings outstanding opportunities to Systems Analysts. If you have 5-10 years sales support experience with minicomputers, a knowledge of assembly language, compilers and operating systems, it's an opportunity you'll want to thoroughly explore. With Level 6, we're on our way with all the signals ahead looking good.

Immediate openings in Chicago, Los Angeles, San Francisco, New York City Area, Washington, DC, Cleveland, Atlanta, Dallas, Boston, Philadelphia and other large cities.

For an immediate reply, please forward your resume to: Kevin A. Keane, Honeywell Information Systems, Inc., M/S 425, 200 Smith St., Waltham, MA 02154.
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Honeywell

NCR

SPECIAL SYSTEMS DIVISION
New Positions in San Diego

The Special Systems Division of NCR located in San Diego, is involved in the development of on-line banking and retail systems. Current and future business commitments require that we add several systems analysts in the following categories:

Communications Software Development

These positions entail the system design and development of software for large communications networks. Experience at all levels in assembly language and a mini-computer background is necessary. Experience in telecommunications, software and a related BS degree is preferred.

Software Support

Requires persons skilled in assembly language, with a sound background in mini-computers to perform maintenance and field support of telecommunications networks. A number of these positions provide the opportunity for substantial travel and customer contact.

Computer Systems Simulation

A position exists for a person with a minimum of two years' experience to perform simulation of computer systems and compiler performance measurement. This position requires knowledge of statistics and queuing theory and programming experience in languages such as Fortran, GPSS or Simscript. A related degree is preferred.

Please submit resume including salary history to Bruce Bertsch, Manager, Industrial Relations.

NCR

Special Systems Division
4045 Sorrento Valley Blvd.
San Diego, Calif. 92121

ANALYSIS/ PROGRAMMER

An Equal Opportunity Employer

A fast growing unit of local government that is home to the University of North Carolina (at Chapel Hill) is organizing a data processing department. We are looking for someone with experience to head this agency. Prior government employment would be helpful but is not necessary. The salary is not fixed but will be commensurate with applicant's experience. A generous fringe benefit package is provided.

Contact: S.M. Gattis
Orange County Manager
106 E. Margaret Lane
Hillsborough, N.C. 27278
(919) 732-8181

BURROUGHS 6700 SOFTWARE SPECIALIST

A national consulting firm located in suburban Chicago and specializing in finance/personnel related matters is in the process of converting their present Burroughs 4700 system to the 6700.

We are seeking an individual who has:

- Significant experience in Burroughs 6700 system software.
- Detailed knowledge of the 6700 operating system, utility programs and programming languages (APL, ALGOL, FORTRAN, with an emphasis on COBOL).
- A working knowledge of the Burroughs 4700.
- Some conversion experience is highly desirable.

Compensation is highly competitive. This is an excellent opportunity for an individual with the requisite interpersonal skills and intellectual capabilities to join our consulting staff upon completion of the conversion.

For immediate consideration please send a detailed resume to include salary history, in confidence to:

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797 Washington St.
Newton, Mass. 02160
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Research and Development Opportunities

Due to Digital Equipment Corporation's steady growth our R&D Group has a continuing need for outstanding people. Ideal candidates will have doctorates in Computer Science (or equivalent theoretical background) and demonstrated practical achievements in their specialties. Such accomplishments as books authored, patents, etc., are pluses. Applicants should enjoy blending research, advanced development, and internal consulting in a stimulating informal atmosphere where the fruits of ideas have visible impact.

Current openings include the following:

Multiprocessed Microprocessor Researcher

Expertise in both software and hardware is required for investigating the potential value of constructing computer systems by connecting some number of simpler computers.

Applications Programming Researcher

Exploring the possibilities of generating and/or customizing application software packages automatically, your goal will be to find less labor-intensive ways to do applications programming.

Operating Systems Researcher

You will research and consult across the full spectrum of operating systems topics. Both a broad knowledge of the state-of-the-art and creativity in generating original ideas are required. Expertise in protection/security/privacy issues would be a plus, but other specialties are also welcome.

Performance Evaluation Researcher

Working closely with software engineering and marketing, you will be responsible for simulation modeling and performance measurement of interactive computer systems, with initial emphasis on DECsystem-20. The primary goals are a better understanding of systems behavior and quantitative information on the performance of current systems.

Ideally, you will have knowledge of the DECsystem-20 or TENEX, research experience, and experience in simulation modeling are desired. Experience in mathematical modeling would be helpful.

Please address your resume outlining salary requirements to Justin Kelleher, Digital Equipment Corporation, Dept. B1122, 162 Main St., Maynard, Mass. 01754.

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The most meaningful experience is a combination of management of a DP installation and direct selling experience of EDP peripheral equipment such as terminals, printers, minicomputers, or small-scale computer systems in the IBM environment.

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Send a short letter describing your recent experience to the President, Box 608, Greenwich, Ct. 06830.

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Requires on-line experience for systems development in Assembler language, maintenance, program testing, and the installation on CDC and PDP equipment.

PROGRAMMER & PROGRAMMER/ANALYST
Requires extensive experience in the design and implementation of applications in an IBM OS/MVT or VS environment using MARK IV, COBOL, FORTRAN. TSO, IMS, IBM 3790 programming helpful.

OPERATIONS PRODUCTION TECHNICAL SUPPORT
Requires extensive experience in IBM 360/370 OS, JCL, coding/debugging, production applications, abend analysis and resolution, OS/AMS utilities, operations documentation review and turnover, MVS background, hands-on experience in computer operations and a knowledge TSO and programming.

SYSTEMS PROGRAMMERS
Requires extensive experience in TSO to work on an IBM 370 MVS system.

We offer excellent salaries, benefits, and growth opportunities. Send resume including salary history in strict confidence to:

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Your qualifications should include 6 years experience in data entry systems sales to the end-user market, plus a background in peripheral and/or main frame.

If you can handle heavy responsibility, you'll be generously rewarded with an excellent salary, commissions and benefits package. For consideration, please rush your resume and salary history to:

BOURNS, INC.
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1200 Columbia Ave.
Riverside, Calif. 92507
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BOURNS

Education: Faculty Position.

Computer Systems Applications and Management Information Systems. Ph.D. required. Professional experience and interest in quantitative approaches to policy analysis desirable. Salary and rank negotiable.

Contact: Director,
Center for Technology and Administration
The American University
Washington, D.C. 20016
An AA/EOE.

SYSTEMS MANAGER

New England financial client has immed need for expd indiv to direct short/long range DP plans to support trust operation. Salary ranges open D.O.E. Fee paid. Contact Stan Durbas (in confidence)

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(203) 278-7170

COMPUTER CENTER DIRECTOR
Continuing full-time Administrative & Professional position. Responsibilities of administration of Center; leadership in planning and coordination; direct staff; develop and administer annual budget. Master's degree in appropriate field, 5 years experience in computing at college and director level; Knowledge of third-generation systems. Zerox Sigma-series equipment experience desirable. Submit curriculum vitae by December 10, 1976 to James Powell, Provost, Oberlin College, Oberline, Ohio 44074. To be filled no later than July 1, 1977. Annual salary range $21,000 to $26,000. *Affirmative Action (M/F) Equal Opportunity Employer*

Systems Analysis - The University of Pittsburgh has positions available in scientific/technical and systems programming.
Systems Designer - Must have excellent background in COBOL, Mark IV, and data base management.
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Send resume to:
James C. Chappars
G-26 Cathedral of Learning
University of Pittsburgh
Pittsburgh, Pa. 15260

BROADCASTING NETWORK CORPORATE HEADQUARTERS IN NYC DUPLEX 270/158 OS VM CICS IMS
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Must know IBM operating systems. Pure development project under CICS; they can train in CICS.
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Benefits, working conditions and the opportunities for promotion are far above the industry average.
Contact Jon Kenneth, Mallory Data Systems Agency, 120 B'way, Suite 3114, NYC 10005 (212) 964-2060.

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Linda Catenacci would like to hear from you at Amdahl Corporation, 680 Fifth Ave., New York 10019. We are, of course, an equal opportunity employer.

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You are the right candidate for this opportunity if you do not *have* to make a move; if you are currently leading your peers in competence, enthusiasm and performance, and if you have a need to be on a winning team selling the better product. You will have a thorough knowledge of the large-scale computer marketplace, and a five-year performance record. You will enjoy the personal and professional satisfaction of selling the proven price-performance leader, and enthusiastically relating the Amdahl success story to a wide audience that is anxious to hear the details. In addition, you will enjoy an extremely attractive income, incentive and benefits package. Immediate openings exist in our Eastern Division, headquartered in New York City.

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This is your opportunity to move into the growing mini computer field with one of our high technology client companies. A minimum of one year programming experience in any hardware requested. COBOL programming experience desired.

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Salary area $18,000

If you have an analytical mind and can work closely with EDP users, this position with a diversified $100 million company offers good equipment and truly promotable future. One plus years programming/analysis experience in business applications required.

For further details, contact Tom Fischer or Tom Lilliker at (713) 658-9898.

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If you prefer, you can mail your resume to Jim Masciarelli's attention at Data General Corp., Route 9, Southboro, MA 01772. An equal opportunity employer.

Data General

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Assisting the Internal Audit Staff, you will be responsible for assuring the reliability of computerized information systems operating with a variety of hardware and software. Physical and data security are major concerns.

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AMF Incorporated
Mr. Michael M. Graham
Mgr./Corporate Recruiting
777 Westchester Avenue
White Plains, N.Y. 10604

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COMMUNICATIONS SOFTWARE DEVELOPMENT

1. This position entails the systems design and development of software for large communications networks. Experience at all levels in PDP/11 Assembly language and telecommunications. Other mini-computer experience will be considered. Some travel required. Salary to mid $20K.
2. This position requires a minimum of 2 years experience in DEC PDP/11 Assembly language. Must have experience with on-line teleprocessing applications with CRT and teleprinting. Salary up to $17K.

Please send resume to:

AW CONSULTANTS, INC.
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Benefits include 1 month vacation, group life and major medical insurance, tax deferred fully vested retirement plan, etc. For prompt consideration, please send detailed resume and salary requirements in confidence to Personnel Director; Project I-23. Please refer to Project Number.

Plasma Physics Laboratory
Princeton University

POST OFFICE BOX 451
PRINCETON, NEW JERSEY 08540

An Equal Opportunity / Affirmative Action Employer M/F

MINI COMPUTER MAINTENANCE SPECIALIST

University Computing Services at the State University of New York at Buffalo has a vacancy for a Mini Computer Maintenance Specialist to maintain mini's and associated peripherals on the SUNY/AB Campus. Candidates should have a minimum of five years experience in the maintenance of mini computers, peripheals, and digital interface circuits with at least two years troubleshooting experience at the component level. Primary experience with Data General, DEC or Varian preferable. Opportunity to manage an expanding maintenance group. Competitive salary. Excellent fringe benefits. Eligibility for future permanent appointment. Write or call in confidence:

James Whitlock
University Computing Services
4250 Ridge Lea Road
Buffalo, N.Y. 14226
(716) 831-1761

Deadline for Applications: Dec. 13. Affirmative Action/Equal Opportunity Employer.

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Interactive

Growing company has excellent opportunities for individuals with degree in engineering, mathematics or equivalent experience to work on state of the art interactive design drafting system.

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Excellent starting salary, ideal professional environment and full fringe benefit program. Relocation expenses paid to this ideal area for living and working.

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Gerber Scientific Instrument Company
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This challenging position requires previous experience in the successful design and implementation of a high level language compiler or interpreter. Planning, communicating and leading skills are also necessary.

Tektronix, Inc., develops, manufactures and markets internationally recognized computer peripherals, precision electronic measurement instruments, and related electronic instrumentation. Located near Portland, Oregon, we are within a two hour drive of the Cascade Mountains or Ocean Beaches. The close-by nature playground and the City of Portland provide a variety of recreational and cultural interests.

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Please send resumes to: Mary A. Walhood, TEKTRONIX, INC., P.O. Box 500, C6, Beaverton, OR 97077.

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SENIOR SYSTEMS ANALYST
SENIOR PROGRAMMER/ANALYST

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Fleetguard, one of the Nation's fastest growing manufacturers of diesel and automotive oil, air, water, fuel, and hydraulic filter systems, is seeking to fill the following positions:

Systems Analyst position requires a college degree and a minimum of 7 years experience which must include on-line order entry and manufacturing.

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Reply in confidence with a resume giving salary history to:

Morris Irby, Jr.

FLEETGUARD, INC.,
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Route 8 Box 39, Cookeville, TN 38501
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ANALYST/PROGRAMMERS
SYSTEMS ANALYST

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Send resume to Bob Lahr, or call (515) 754-3626.

FISHER Controls

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SYSTEMS ANALYST

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Chicago, Illinois 60606
(P.S. Be sure to use home address and indicate position title.)
Or call your nearest Source Edp Office:

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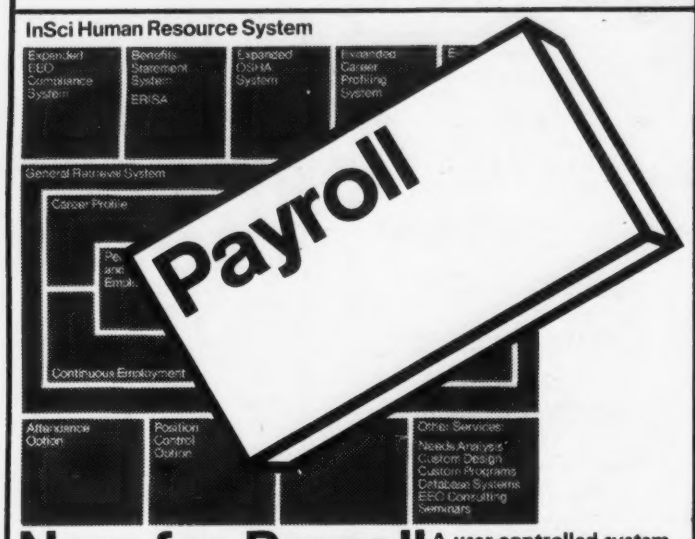

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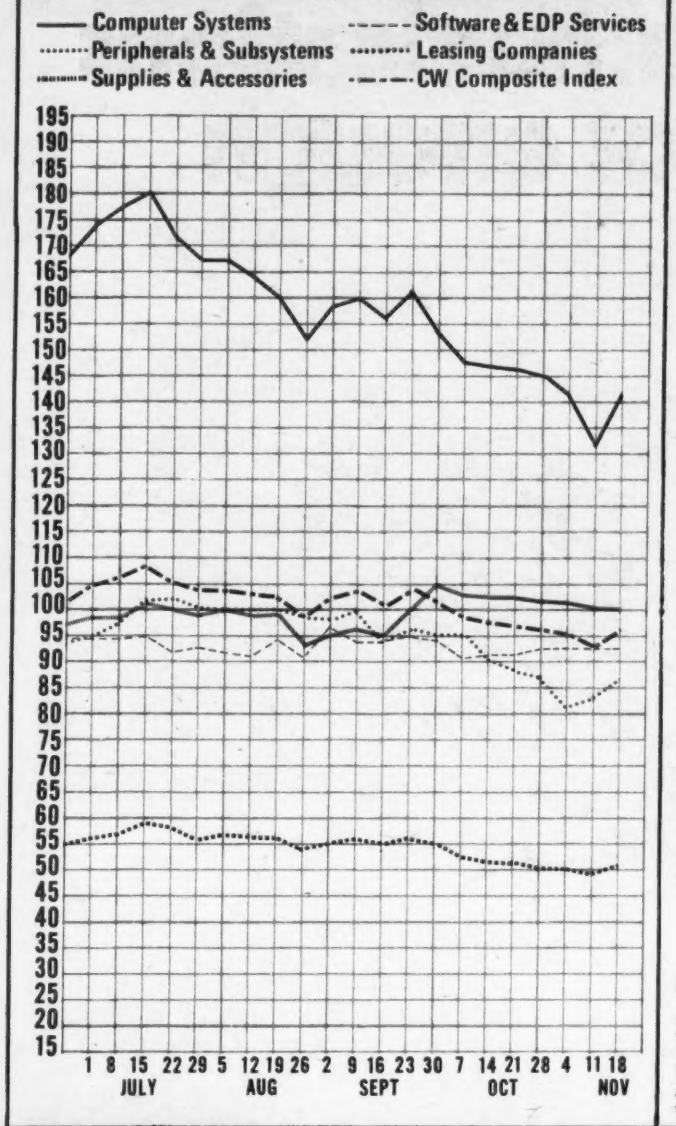

Earnings Reports

INCOTERM
Three Months Ended Aug. 28

	1976	1975
Shr Ernd	$.28	$.29
Revenue	8,873,000	7,999,000
Earnings	556,000	585,000
6 Mo Shr	.46	.65
Revenue	17,118,000	15,612,000
Tax Cred	.....	193,000
Earnings	912,000	1,298,000

MEGADATA COMPUTER & COMMUNICATIONS
Three Months Ended July 31

	1976	1975
Shr Ernd	$.09	$.02
Revenue	1,427,000	840,000
Tax Cred	.....	6,890
Earnings	79,425	15,350
9 Mo Shr	.24	.....
Revenue	4,247,000	2,007,000
Tax Cred	.....	29,190
Earnings	194,672	82,754

MOHAWK DATA SCIENCES
Three Months Ended July 31

	1976	1975
Shr Ernd	$.19	$.31
Revenue	38,948,000	41,732,000
Tax Cred	545,000	685,000
Earnings	1,436,000	2,158,000

DATAPRODUCTS
Three Months Ended Sept. 25

	1976	1975
Shr Ernd	$.36	$.21
Revenue	28,181,000	20,209,000
Earnings	2,654,000	1,401,000
6 Mo Shr	.83	.45
Revenue	54,881,000	38,902,000
Earnings	a6,229,000	b3,132,000

a-Includes $1.1 million gain from sale of building. b-Includes $739,000 gain on sale of Data Card Corp. shares.

DECISION DATA COMPUTER
Three Months Ended Aug. 28

	1976	1975
Shr Ernd	$.12	.....
Revenue	8,721,000	$7,579,000
Earnings	440,000	a(663,000)
9 Mo Shr	.....	.....
Revenue	25,542,000	30,426,000
Loss	152,000	d170,000

a-Includes $192,000 from foreign investment write-off.

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TRADE*QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, NOVEMBER 17, 1976

All statistics compiled, computed and formatted by TRADE*QUOTES, INC. Cambridge, Mass. 02139

EXCH		1976 RANGE (1)	CLOSE NOV 17 1976	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
O	AMDAHL CORP	23- 30	27 7/8	+2 3/8	+9.3
N	BURROUGHS CORP	84-108	89 7/8	+4 3/8	+5.1
O	COMPUTER AUTOMATION	10- 19	14 1/8	- 1/4	-1.7
N	CONTROL DATA CORP	18- 27	22	+ 3/8	+1.7
N	DATA GENERAL CORP	40- 60	45	+1 1/2	+3.4
O	DATAPOINT CORP	24- 46	28 1/4	+4 3/4	+20.2
O	DIGITAL COMP CONTROL	2- 7	5 3/8	- 1/8	-2.2
N	DIGITAL EQUIPMENT	46- 60	52 1/4	+3 1/4	+6.6
N	ELECTRONIC ASSOC.	2- 5	2 1/8	- 1/8	-5.5
A	ELECTRONIC ENGINEER.	7- 16	8	+ 3/8	+4.9
O	FOUR-PHASE SYSTEMS	13- 21	14 3/8	+ 1/4	+1.7
N	FOXBORO	28- 50	44 1/2	+1 1/4	+2.8
O	GENERAL AUTOMATION	4- 11	4 1/4	+ 1/8	+3.0
O	GRI COMPUTER CORP	1- 1	5/8	0	0.0
N	HEWLETT-PACKARD CO	80-117	83 3/8	+1 7/8	+2.3
N	HONEYWELL INC	34- 56	43 1/2	+1 7/8	+4.5
N	IBM	227-288	267 1/2	+6 1/2	+2.4
O	MANAGEMENT ASSIST	1- 6	5 3/4	+ 1/4	+4.5
O	MEMOREX	17- 33	18 1/4	+ 1/8	+0.6
O	MICRODATA CORP	10- 28	14 1/8	- 1/2	-3.4
O	MODULAR COMPUTER SYS	3- 14	3 3/4	+1 1/4	+50.0
N	NCR	24- 37	33 1/4	+ 3/4	+2.3
O	PRIME COMPUTER INC	4- 14	14	+ 3/4	+5.6
N	PERKIN-ELMER	19- 27	19 1/4	- 3/4	-3.7
N	RAYTHEON CO	45- 67	60	+ 7/8	+1.4
N	SPERRY RAND	40- 52	44 3/8	+1 7/8	+4.4
O	SYCOR INC	9- 31	12 1/2	+3 1/2	+38.8
A	SYSTEMS ENG. LABS	5- 10	6 1/8	+1 1/8	+22.5
N	VARIAN ASSOCIATES	12- 17	13 1/4	+ 7/8	+7.0
A	WANG LABS.	11- 20	13 5/8	+ 1/4	+1.8
	LEASING COMPANIES				
O	BOOTHE COMPUTER CORP	1- 8	6 1/2	+ 3/8	+6.1
O	COMDISCO INC	3- 10	9 1/2	+ 1/2	+5.5
A	COMMERCE GROUP CORP	2- 3	1 3/4	+ 1/8	+7.6
A	COMPUTER INVSTRS GRP	1- 3	1 3/8	0	0.0
M	DATRONIC RENTAL	1- 8	7/8	+ 1/8	+16.6
A	DCL INC	1- 1	5/8	0	0.0
N	DPF INC	5- 8	6 7/8	+ 1/2	+7.8
N	ITEL	6- 15	12 1/2	+ 5/8	+5.2
N	LEASCO CORP	6- 19	18	+ 3/8	+2.1
O	LEASPAC CORP	0- 1	1/8	0	0.0
O	NRG INC	0- 1	1/8	0	0.0
A	PIONEER TEX CORP	6- 9	7 1/4	0	0.0
N	U.S. LEASING	7- 12	8 5/8	+ 1/4	+2.9
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	1- 3	1	- 1/8	-11.1
O	ANACOMP INC	6- 11	6 3/4	- 1/4	-3.5
A	APPLIED DATA RES.	2- 4	3 5/8	- 1/8	-3.3
N	AUTOMATIC DATA PROC	17- 35	27 1/2	+2	+7.8
O	COLEMAN AMERICAN COS	2- 6	2 3/8	- 1/8	-5.0
O	COMPU-SERV NETWORK	3- 10	8	-1 1/4	-13.5
O	COMPUTER DIMENSIONS	3- 7	5 3/4	0	0.0
O	COMP ELECTION SYSTMS	5- 9	5 1/4	+ 1/2	+10.5
O	COMPUTER HORIZONS	1- 2	1 1/2	+ 1/4	+20.0
O	COMPUTER NETWORK	2- 6	5 3/4	+ 3/8	+6.9
N	COMPUTER SCIENCES	4- 8	5 5/8	0	0.0
O	COMPUTER TASK GROUP	1- 2	1 1/4	0	0.0
O	COMPUTER USAGE	3- 6	2 3/4	+ 1/4	+10.0
O	COMSHARE	2- 9	5 1/2	+ 3/4	+15.7
O	DATA DIMENSIONS INC	2- 4	3	- 1/4	-7.6
O	DATATAB	1- 2	1 1/2	0	0.0
N	ELECTRONIC DATA SYS.	12- 18	15 7/8	+ 7/8	+5.8
O	INFONATIONAL INC	1- 1	1/8	0	0.0
O	INSYTE CORP	1- 3	1 1/2	+ 1/8	+9.0
O	IPS COMPUTER MARKET.	1- 2	1 1/8	- 1/4	-18.1
O	KEANE ASSOCIATES	2- 4	2 3/8	- 5/8	-20.8
O	KEYDATA CORP	1- 5	1 1/2	- 1/8	-7.6
O	LOGICON	3- 5	5	+ 1/4	+5.2
A	MANAGEMENT DATA	1- 3	2	0	0.0
A	NATIONAL CSS INC	13- 25	18	+ 1/4	+1.4
O	NATIONAL DATA CORP	4- 7	5	0	0.0
A	ON LINE SYSTEMS INC	17- 22	18 5/8	+1 5/8	+9.5
N	PLANNING RESEARCH	3- 5	3 5/8	+ 1/2	+16.0
O	PROGRAMMING & SYS	1- 1	3/8	0	0.0
O	RAPIDATA INC	2- 5	1 5/8	- 1/4	-13.3
O	REYNOLDS & REYNOLD	13- 21	15 1/4	- 3/4	-4.6
O	SCIENTIFIC COMPUTERS	1- 1	7/8	0	0.0
O	TYMSHARE INC	14- 28	16 1/2	+1 3/4	+11.8
A	URS SYSTEMS	3- 5	3 1/2	- 1/4	-6.6
N	WYLY CORP	1- 7	1 1/4	- 3/8	-23.0
	PERIPHERALS & SUBSYSTEMS				
N	ADDRESSOGRAPH-MULT	8- 13	11	+1	+10.0
O	ADVANCED MEMORY SYS	4- 10	6 1/4	- 1/2	-7.4
N	AMPEX CORP	5- 10	6 1/4	+ 1/8	+2.0
O	ANDERSON JACOBSON	2- 4	3	+ 1/8	+4.3
O	APPLIED DIG DATA SYS	13- 25	16	- 1/2	-3.0
O	BEEHIVE MEDICAL ELEC	3- 9	8 3/8	+ 1/8	+1.5
A	BOLT,BERANEK & NEW	7- 11	7 7/8	+ 1/8	+1.6
N	BUNKER-RAMO	5- 10	7 1/8	+ 3/8	+5.5
A	CALCOMP	4- 7	4 3/4	+ 3/8	+8.5
O	CAMBRIDGE MEMORIES	0- 6	1/2	- 1/8	-20.0
N	CENTRONICS DATA COMP	20- 36	24 7/8	+1 5/8	+6.9
O	CODEX CORP	22- 42	28 1/2	+1 1/2	+5.5
O	COGNITRONICS	1- 1	1/2	0	0.0
O	COMPUTER COMMUN.	1- 6	4 7/8	+ 3/8	+8.3
O	COMPUTER CONSOLES	4- 7	4 1/4	+ 3/4	+21.4
A	COMPUTER EQUIPMENT	1- 3	1 7/8	+ 1/4	+15.3
O	COMPUTER TRANSCEIVER	1- 3	7/8	+ 1/8	+16.6
O	COMTEN	4- 9	7 1/8	+ 1/8	+1.7
N	CONRAC CORP	20- 25	21 1/2	+ 3/4	+3.6
O	DATA ACCESS SYSTEMS	1- 5	4 3/4	- 1/4	-5.0
O	DATA 100	6- 13	6 5/8	+ 3/8	+6.0
A	DATA PRODUCTS CORP	5- 15	11	+ 1/2	+4.7
O	DATA TECHNOLOGY	1- 2	1 1/2	+ 1/4	+20.0
O	DATUM INC	1- 2	5/8	- 1/8	-16.6
O	DECISION DATA COMPUT	1- 4	1 1/2	0	0.0
O	DELTA DATA SYSTEMS	1- 1	1/2	- 1/8	-20.0
N	ELECTRONIC M & M	1- 4	2 5/8	0	0.0
O	FABRI-TEK	1- 1	7/8	0	0.0
O	GENERAL COMPUTER SYS	0- 2	1/2	+ 1/8	+33.3
N	HAZELTINE CORP	4- 12	8 5/8	+ 5/8	+7.8
N	HARRIS CORP	34- 55	50 3/8	+ 3/8	+0.7
A	INCOTERM CORP	9- 20	11 3/8	+ 7/8	+8.3
O	INFOREX INC	3- 7	3 7/8	0	0.0
O	INFORMATION INTL INC	10- 18	12	+ 1/2	+4.3
O	INTEL CORP	47-109	48 1/2	+1 1/2	+3.1
A	LUNDY ELECTRONICS	3- 7	3 3/8	0	0.0
O	MSI DATA CORP	3- 7	6 1/4	- 1/4	-3.8
A	MILGO ELECTRONICS	15- 22	20 5/8	+ 1/8	+0.6
N	MOHAWK DATA SCI	3- 10	5 1/2	+ 1/8	+2.3
O	PENRIL CORP	1- 3	1 7/8	0	0.0
A	PERTEC CORP	3- 8	5 3/4	- 1/8	-2.1
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	3- 10	2	0	0.0
O	QUANTOR CORP	4- 6	4 5/8	+ 5/8	+15.6
O	RECOGNITION EQUIP	6- 11	8 3/8	+ 5/8	+8.0
N	SANDERS ASSOCIATES	6- 11	8	+ 5/8	+8.4
O	SCAN DATA	1- 4	1 1/4	0	0.0
O	STORAGE TECHNOLOGY	9- 13	10 5/8	+ 5/8	+6.2
O	T BAR INC	5- 10	5 1/2	- 1/8	-2.2
O	TALLY CORP.	4- 6	5 3/8	+1 3/8	+34.3
O	TEC INC	3- 7	6 1/2	0	0.0
N	TEKTRONIX INC	45- 69	60	+1 1/4	+2.1
N	TELEX	2- 5	2 1/4	0	0.0
O	WANGCO INC	11- 22	21 1/8	0	0.0
O	WILTEK INC	2- 2	1 3/8	0	0.0
	SUPPLIES & ACCESSORIES				
O	ADVANCED SYSTEMS INC	1- 4	3 3/8	0	0.0
O	BALTIMORE BUS FORMS	3- 5	3 5/8	+ 1/8	+3.5
A	BARRY WRIGHT	6- 10	8 5/8	+ 5/8	+7.8
O	CYBERNATICS INC	0- 1	3/8	- 1/8	-25.0
A	DATA DOCUMENTS	25- 45	45 1/4	0	0.0
O	DUPLEX PRODUCTS INC	13- 24	12 3/4	0	0.0
N	ENNIS BUS. FORMS	6- 8	5 5/8	- 1/8	-2.1
O	GRAHAM MAGNETICS	8- 13	10 1/4	0	0.0
O	GRAPHIC CONTROLS	13- 19	16 1/4	+ 1/4	+1.5
N	3M COMPANY	53- 66	56 1/2	+1 1/4	+2.2
O	MOORE CORP LTD	32- 51	33 1/4	0	0.0
N	NASHUA CORP	11- 18	15 3/4	+ 1/2	+3.2
O	STANDARD REGISTER	15- 19	17 1/4	0	0.0
O	TAB PRODUCTS CO	5- 11	8 3/4	0	0.0
N	UARCO	19- 25	19 3/8	- 1/4	-1.2
A	WABASH MAGNETICS	4- 9	9 1/4	+ 7/8	+10.4
N	WALLACE BUS FORMS	19- 25	22 1/8	- 3/8	-1.6

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
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